THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., NOVEMBER 5, 1891.

THE WEEK IN IRON CIRCLES.

General Features.

The past week has been one of intense excitement in political circles, especially in Ohio, where the national policy of Protection has been chiefly under discussion. With an unmistakable verdict in its favor, business interests may well settle down for the present with reasonable assurance that the moral effect of the result will be salutary, and that restored confidence in the future will soon be the order. The conditions of trade, as noted by our reports, are healthy, and financial affairs are easy and accommodating. In pig iron circles, considerable interest has been developed by the placing of a large order by a pipe works company, during the past week. The amount is stated at 9,000 tons, and the quality selected was Southern mill iron and softeners for delivery during the next six to eight months, at prices not higher than $10.50, furnace, for No. 3 Foundry. Among Southern furnaces, one has over 40,000 tons of grey forge booked, and another has sold in two months' time over 70,000 tons. These companies, if cars could be obtained, would have very little iron to offer for the coming year. Grey forge is especially scarce and hard to obtain. No. 1 foundry is being held and sold, in some instances, at $12.50, furnace, but sales have been made at $12. The position among car wheel companies in the South is such that any further heavy buying will cause an advance. It is reported that one of the leading car wheel companies has sold 9,000 tons ahead, another 7,000 tons, and that a meeting has been held and they have decided to offer no more iron. One of the furnaces of the Clifton Company was burned down, so that they will hardly make as much iron as was anticipated. At Anniston, reports are made that they are sold up, and that one of the furnaces will soon go out of blast. As the buying of car wheel iron has been largely confined to St. Louis and one car company at Detroit, placing of further orders in the West will likely lead to strong prices for car wheel irons. One sale East is reported at $10.40, furnace, and a small order taken upon same basis West. A moderate amount of buying marks the Chicago market, some deals of large size have been consummated but small lots constitute bulk of business going. Lake Superior charcoal is somewhat more active, several inquiries being in for round lots. There is no improvement in this direction in the way of prices, however; $17 is an open figure with some reports of shading on the part of smaller furnaces. None of the leading brands are obtainable for anything less, and in two or three cases $18 is the limit. Consumption goes on at a healthy rate, and business in most lines continues good. The business of the week at Cincinnati has been of fair volume, but there has been no special activity. There has been a limited inquiry for Southern irons for immediate and nearby deliveries, and with prices for such, ruling considerably less than for deliveries the first six months of next year. A few large and several small sales have been made for this year's deliveries, but the bulk of the trading, which amounts to a fair average business, has been for next year's supplies. Northern coke irons have not improved in prices, but, on the contrary, former prices could be shaded to buyers of round lots. We hear of extremely low prices being made in the Wheeling district on Valley irons, so low that Southern irons for the present are not in competition. Softeners are in rather better demand at St. Louis. The stove foundries in this section are having a good business, and are busier than almost any other line of trade. The Buffalo market shows about as little life as at any time this year. Most furnaces seem reasonably well supplied with orders. Some few, however, are offering for immediate and even for extended delivery at reduced rates. Prices consequently continue to show some variation. Some level-headed business men believe that the steady advance in prices so freely predicted a few weeks ago, and realized in part to date, will continue into next year, and that history will repeat itself, the general industries of the country demanding materials in excess of supply, and usher in a swelling tide that will carry values up to the high flood of '79 and '80. On the other hand, equally good business men express doubts of any further improvements being realized very soon.

The Local Situation.

All the indications point to a speedy closing of the marine season, most vessel men laying up their boats as fast as they make port along the lower lakes. Although the grain interests now offer fair employment to some of the boats, the opportunity comes too late for most men engaged in the lake trade, and in consequence the bulk of the grain to be yet forwarded will come by rail, and at rates so much higher than lake transportation that they will eat up quite a portion of the advance recorded some time ago. The ore men are resting on their oars, as it were. They are in a good position to await events, much better, by far, than any other industry connected with the iron business. The season closes with so marked a falling off in the ore shipments that it is quite evident that the visible supply will be exhausted long before the opening of next year's shipping season. Whatever the price of pig iron, the producers of ore will be justified, next Spring, in asking an advance over the price paid this year, and in the course of probable events the advance will be paid without question. There is still a little ore being sold, here and there, to fill out mixtures, and at an advance which fairly covers the higher lake freights. So, for instance, five thousand tons of an ore that sold at $3.50 early this Summer found a market this week at $3.85. The railways are shipping ore to the various furnaces as fast as received, owing to improvements in rail forwarding no less than to the falling off receipts, and there can be little doubt that the docks, this Fall, will be scraped clean as they have never been in the past ten years. Producers of Bessemer ore that has found a tidewater market, these two or three years, when ocean freights were high, are somewhat disturbed over the reopening and successful working, in New Jersey, of abandoned mines. The process is, of course, patented, but if its operation could be extended to the Lake Superior country, there would be no end of valuable property that has been abandoned for lack of paying results with ordinary methods. Pig iron is low, and although one firm reports an advance of fifty cents, the report is not substantiated by the trade in general. In fact, so far is the market from advance, that three valley furnaces have engaged a considerable portion of their output for a five months' delivery, at the ruling quotations. Bessemer seems to have reached the lowest point at which it has ever been sold, about fifteen dollars being the Pittsburgh price; and there have been some sales that netted the furnace only $13.75. Some grades of pig iron command a better sale, such as soft foundry iron, but all the Bessemer products are affected by the slump, and the feeling is decidedly depressed in everything but combination shapes. Steel rails are high enough, thirty dollars being a comparatively good price, but there is no demand. Billets and slabs have been known to change hands this week at the unprecedented price of $24.25, and as the cost of making billets is about the same as that of making rails, the difference in the price will at once attest the pitiful condition of the iron market as far as it relates to all the products outside of combinations.

AMERICAN ARMOR PLATES AHEAD.

The marvelous ability of American steel makers to adjust themselves to new conditions and turn out improved products in competition with the world is again shown by the tests of armor plate, held near Washington last Saturday. One year ago no armor plate had yet been turned out in this country. At that time a test was made at Annapolis of three foreign-made plates. On Saturday last three American-made plates, representing two makers, were tested, and at least one of them was pronounced better than the best tried at Annapolis.

The plates tried on this occasion were the first of a lot of eight that has been ordered for the present series of tests. They included a high carbon nickel steel plate from the Bethlehem Iron Works, containing about 3 per cent. nickel and 38 per cent. carbon; a low carbon nickel steel plate from Carnegie, Phipps & Co., containing the same percentage of nickel and but 25 per cent. carbon, and a low carbon all-steel plate treated by the Harvey process of superficial carbonization from the Bethlehem Iron Works. The plates were made for the purposes of comparison of the same dimensions as those tried at Annapolis—eight feet high, six feet wide and ten and a half inches thick. Five shots were fired at each plate—four from a six-inch gun, and one from an eight-inch gun. The powder charge in the six-inch gun was 42.4 pounds, giving a striking velocity of 2 075 feet per second. In the eight-inch gun the powder charge was 74½ pounds, and the striking velocity was 1,750 feet per second. These were the same velocities used in the Annapolis trials.

The general results arrived at were, that the low carbon nickel steel stood first in point of resistance; the high carbon nickel steel second, and the low carbon all-steel, Harveyized, third. The Harveyized plate did not prove as invulnerable as was expected, but judgment should be reserved until the tests are concluded. Enough is known, however, to justify the claim that the American plates more than equaled the foreign plates as they appeared in the Annapolis trials.

One important discovery, of interest to steel makers generally, was made by the Carnegie representatives in connection with the test. Their plate, the low carbon, nickel steel, proved more efficient in its lower half than in the upper portion. This is attributed to the double-tempering the lower part of the plate received by accident. The workmen deserted the plate while it was immersed in oil, on the liquid taking fire, and it was permitted to go through the process twice. The result is that added strength is given a plate which is so treated, and an important method has grown out of what at the time was considered an incident of carelessness.

SOUTHERN RAILROADS AND SOUTHERN IRON.

More than three years ago *The Iron Trade Review* remarked, concerning the exceptionally favorable position of Southern iron furnaces for placing their product on Northern markets, that the question was one in which the railroads would in the future play a leading and influential part. So long as they favored the Southern furnace men with extremely low freights, the competition would be close and exciting, but they (the railroads) had it absolutely in their hands to say how far this competition should go, and just when it should cease. The beginning of the crisis seems to have come even before it might reasonably have been expected. Already complaints have been entered against some of the Southern trunk lines for discriminations, that would not be tolerated in States having railroad commissions. As an instance we note, that under the schedule of freight charges fixed by the railroads, 37 cents per hundred pounds is charged on freights from Charleston to South Carolina points, and on the same goods classed the same, the charge from Richmond, Va., to the same points in South Carolina is 24 cents a hundred pounds. That is to say, the rate is 35 per cent. less on the long haul than on the short. If this is of a piece with what may be expected with reference to North-bound freights, the markets for Southern pig iron may be considerably circumscribed, if a remedy is not speedily forthcoming. Already State bar associations and commercial bodies have awakened to the gravity of the situation and some drastic legislation has been the result and is now pending. Commenting on this subject, the *Tradesman* (Chattanooga) says:

> **Every close observer has noted the growth of anti-railroad sentiment in the South especially, and that its spread has been among the more intelligent and conservative members of the community. If the railroad directories are wise, they will pay attention to these facts and correct the abuses complained of; for regulation by law will almost certainly change the current, and work injustice and damage to the roads.**

Recently we made note of the fact that Northern irons had driven the Southern article out of the Wheeling market, at least temporarily. How far this may have resulted from increased freight discrimination, we are not advised, but Southern shippers are doing well to take hold of the evil before it develops to such large proportions as to be practically uncontrollable.

THE TINPLATE IMPORTERS' PRONUNCIAMENTO.

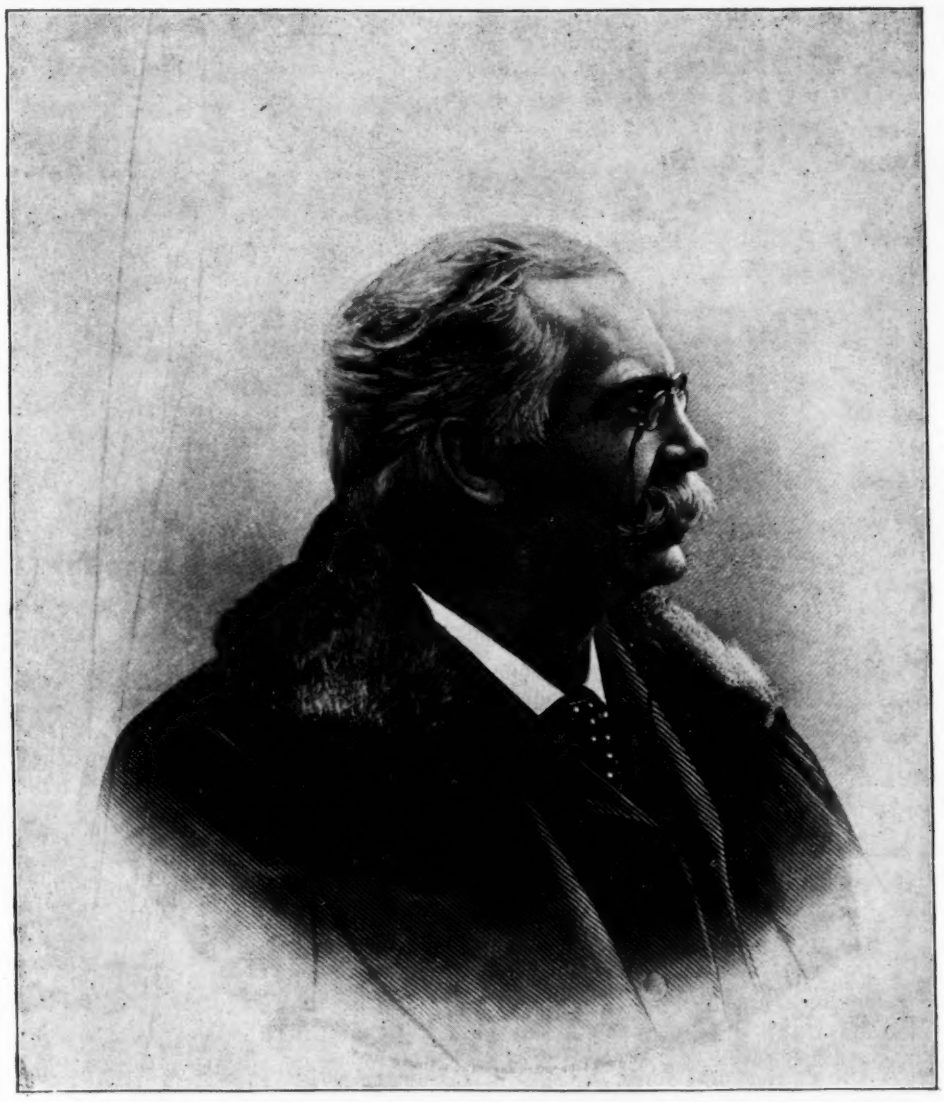
The country is being harrowed over by the recently organized "Tin-plate Consumers' Association of the United States" in order to secure "a thousand or more consumers of tinplates in the association" before it commences work. One metal firm thus approached, has sent this literature to us. As the aims of the organization are best judged by the utterances of its promotors, we presume the highly patriotic position assumed by the Hon. T. L. Bunting, at the initial meeting, will justly represent the *raison d'etre* of the T. P. C. A. U. S. Mr. Bunting, in addition to being a Congressman-elect, is President of the New York Packers' Association and Vice-President of the National Packers' and Canners' Association, so he must speak with authority. Of course Mr. Bunting is very disinterested on the subject. It is not because he is a consumer of tinplates, oh no! that he proposes through this organization to wage warfare upon the tariff policy of the party that has put him in his present political position. It is because—but we utterly fail to find in his printed remarks just what philanthropic inspiration moved him to take up the fight on behalf of the Welsh manufacturers. His constituents, however, may be interested in contemplating this choice morsel of inspired eloquence: "*We do not care a fig for politics, if our pockets are affected.*" The voters in Mr. Bunting's district will doubtless make due note of this. Elected to an honorable position as a representative of a National Protective Policy, once in, he throws principle to the winds and measures his opinions by the size of his pocket. Neither Mr. Bunting nor his associates in the T. P. C. A. U. S. appear to be able to rise above the low plane of their own immediate selfish interests. The establishment of a great industry in this country, whereby we shall be free from paying enormous tribute to the Welsh manufacturers, does not appeal to them in the least. They think they see a cutting down in their profits in the immediate future, and that is enough for them. They could not please the foreign enemies of American Protection better than by their present course.

ENGLISH HEMATITES FOR AMERICAN STEEL MAKERS.

Owing to the increasingly high freights for grain, caused by the heavy shipments from the United States to England, a great deal of ocean tonnage has recently been attracted to that branch of the carrying trade. The consequence is, that there is a very large amount of light tonnage coming this way; hence, vessel men are quite willing to load up with any coarse material that will serve as ballast, upon which they charge an exceedingly low rate. This has led, as on previous occasions, when similar conditions have prevailed, to the shipment of several cargoes of English hematite ore, the purchasers being some of the large American steel makers on the Atlantic seaboard. Thus in spite of the present tariff of 75 cents per ton, just so much of American ore is displaced by the English article. Attention is called to this fact, not necessarily to draw the conclusion that the present duty should be raised—which would scarcely be wise in order to meet temporary conditions—but to show, that in demanding 75 cents as the minimum duty on this material, the iron ore producers were simply asking what was right, without going to extremes. Had they been disposed to assume a selfish position and seek to entirely prohibit foreign importations of iron ore, they could have insisted that the duty be placed at some such figure as $1.50; they chose to be placed at an occasional disadvantage, such as now prevails, rather than be open to the charge of making excessive and unreasonable demands.

A CLEAR VICTORY FOR PROTECTION.

Aside from partisan results, with which *The Iron Trade Review* has nothing to do, the election of William McKinley to the governorship of Ohio is a matter for rejoicing among the friends of Protection everywhere. The contest was one of principle, and had it turned out adversely to the great tariff leader the fact would have been heralded throughout the world as the doom of Protection in the United States. As it is, the significance of the outcome should not be less widely made known. It was a distinct and positive victory for Protective principles and means that the great policy, which has so marvelously built up the material interests of this country, will continue to be the watchword of the American people, despite the temporary check which it received at the last congressional elections. We invite the attention of our foreign exchanges to this notable result, and particularly suggest that the Anglomaniacs at home, who have made their



S. A. FULLER,

LATE GENERAL MANAGER AND TREASURER UNION ROLLING MILL CO., CLEVELAND, O.

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fight on the basis of misrepresentation of the tinplate industry, now turn their attention to a study of the question, "How not to overdo it."

WE interpret the receipt of a marked copy of the New York *Financial Record* to mean a request on the part of the American Pig Iron Storage Warrant Company, of New York, that we read, note and inwardly digest the fact that the furnaces which have now signed with the Warrant Company represent a product of over 2,000,000 tons per annum. The A. P. I. S W. Co. will accept marks of our distinguished consideration and kindliest wishes for the failure of its effort to introduce the pig iron gambling methods of London speculators upon the American continent.

REFERRING to Sir Henry Bessemer's experiments in rolling iron directly from the fluid metal, the *Colliery Guardian* (London) remarks: "Now that the McKinley tariff has to be fought is just the time for some of our South Wales steelmasters to take up the matter, as it might prove a valuable means of regaining possession of the American market." Now that the possibilities of the new process are opening up, is just the time for some ingenious American to take up and perfect the matter and get ahead of his British cousins.

OHIO petroleum is to be used as fuel on the Inman line of ocean steamships. This is another important advance in the use of oil. The pronounced success of the fuel is shown by its liberal use in Chicago mills and manufactories. Over 6,000 barrels are piped there daily from Ohio with satisfactory results. Formerly the oil was objectionable on account of its odor, but through the ingenuity of chemists the crude has been deodorized to such an extent that its smell is hardly noticeable.

HASTEN the progress of the movement to decimalize the currency of Great Britain! The latest proposition is to make the pound sterling consist of 1,000 farthings, instead of 960 as now, the shilling 50 farthings and the sixpence 25. British currency would be relieved of many complications by the charge.

IN the publication of the article on the historic Brook furnace, by a typographical error we stated that it ceased operations in 1884; it should have read 1814.

DID KELLY INVENT THE BESSEMER STEEL PROCESS?

The November number of the *Popular Science Monthly* contains the ninth article in the series by William F Durfee on the "Development of American Industries Since Columbus," and which is the concluding paper devoted to the manufacture of steel in this country.

On the article the *Ohio Valley Manufacturer* makes the following comments:

The article is a very valuable addition to the somewhat meagre records of early steel making in this country and contains much that is not only interesting, but of the utmost historical value. Mr Durfee shows conclusively that the Bessemer process, although justly so called in honor of the distinguished metallurgist who brought it to its high state of perfection, was, as a matter of fact, the earlier discovery of Wm. Kelly Both were operating in the same field of experiment at the same time, but Kelly's claims of priority was satisfactorily proven to the commissioner of patents, who decided in the interference proceedings, that priority was due to Kelly, although a patent had already been granted to Bessemer, gave another over him to Kelly. This was in 1857, and in 1870 the commissioner refused to extend the patent of Bessemer, holding that it should not have been granted, as Kelly's was the prior invention and granted an extension of seven years to Kelly's patent, holding that he had not been sufficiently remunerated for his invention. In regard to the early history of steel making by this process, Mr. Durfee says:

While Z S. Durfee was on his first visit to Europe, the writer of these papers was invited by Captain Ward to design and erect an experimental plant to determine the possibility of making a good steel by the new process from Lake Superior iron. I accepted the invitation, and reached Detroit, Mich., on the morning of July 1, 1862. It was decided to construct a blowing engine, and a converting vessel large enough for producing steel on a commercial scale, with reference to their use in a works properly planned for economical administration and production should the experimental works justify such an enterprise. As to the rest of the plant, it was decided to construct it as cheaply and simply, as would answer the purpose of the experimental works only, and it was further decided, that the experimental plant was to be located adjacent to, and partly in, the building of the Eureka Furnace at Wyandotte, Mich., about ten miles from Detroit, where Captain Ward had extensive rolling mills. The metal for the experiments would be taken direct from the blast furnace, and the *spiegeleisen* was to be melted in crucibles.

As soon as this general scheme was fixed upon, I began my plans for carrying it out. But very little guidance was obtainable in this task. I had never seen any apparatus for the manufacture of steel by the method proposed, and the description of that used by Mr. Kelly, convinced me that it was not suited for an experiment on so large a scale as was contemplated at Wyandotte. As it was confidently expected that Z S. Durfee would be able to purchase Bessemer's American patents, it was thought only to be anticipating the acquisition of property rights to use his inventions. I accordingly procured copies of his patents, which, together with the description contained in the first edition of Fairbairn's "History of the Manufacture of Iron," embraced all the information then accessible to me, relative to the European practice of the new art.

* * * Very soon after entering upon the study of the new process, it became evident to me that an accurate knowledge of the chemical constituents of the metals and other materials employed was essential to its successful conduct; for, after we had found by working them that certain irons were, and others were not suited to our purpose, analysis would in future enable us to determine, whether any offered brand of iron was of suitable quality. These considerations, with others, determined the addition of a chemical laboratory to the works.

As late as 1868 a large establishment for the manufacture of steel (in which over a million dollars was invested), commenced operations in western Pennsylvania, and at the end of one year it was abandoned and dismantled, the whole of the investment having been utterly lost in consequence of attempting to use material, which an analysis costing not over fifty dollars, would have shown to be absolutely unfit for the purpose intended. American "iron masters" (so called) were not alone in their contempt of chemistry. I have in my possession a pamphlet published by a well-known firm of steel manufacturers in Sheffield, England, as late as 1870, for the purpose of attracting attention and trade, in which the following sentences occur: "The various articles on the manufacture of cast steel in encyclopedias and other works are for the most part out of date or are written by scientific men, having little or no practical acquaintance with the subject, and consequently are not of much value. * * The steel manufacturers of Sheffield are not chemists. The application of chemistry to the manufacture of cast steel has not yet met with any success. The analysis of steel is a very difficult process. It has frequently been attempted in Sheffield, but never with any practical success." It is possible that the triumphs of chemistry during the past twenty years, as illustrated by the Thomas Gilchrist and many other important improvements in metallurgical practice, may have convinced the worshipers of the ultra-practical—American as well as English—that there are possibilities in chemistry not dreamed of in their philosophy.

In the works at Wyandotte, on one of the early days of September, 1864, was produced, under the supervision of the writer of these papers, the first "Bessemer steel" made in America. This event was a great disappointment t all those who had filled the air with predictions of failure, and they immediately turned their attention to a general depreciation of the results attained, and the persecution, with renewed vigor, of all who were responsible for them.

In a foot-note, Mr. Durfee makes the following interesting revelations: I adopt here and elsewhere in this article the popular designation, for the reason that I believe it to be the just and proper one; for while there is no room for a doubt that the late William Kelly anticipated Bessemer by several years in the discovery of the fundamental idea of the process, he did not carry it out to its ultimate possibility as a means for the manufacture of steel; and while there is no reason to believe that Bessemer ever heard of what Kelly was doing, it is pretty certain that had not Kelly noted the granting of a patent to Bessemer he would never (owing to his unfavorable location, supplemented by pecuniary embarrassment) have been able to procure such attention from the iron trade of this country, as would have insured him any reward for his invention. Furthermore, although in Kelly's stationary "converter," it would have been, under proper management, quite possible to make a satisfactory quality of steel (stationary "converters" were used in Sweden with success for many years), it was quite evident from the first that the highly original and ingenious apparatus invented by Bessemer (especially the tilting "converter" and the "casting ladle" having a tap-hole in its bottom) was far superior to anything proposed by Kelly. It is also quite evident that had not Mushet (or some one else) suggested the use of spiegeleisen, neither the idea of Kelly nor Bessemer would have been of value, except in the direction in which they were practically carried out by Kelly, as a substitute for the refinery-fire, or in the special case of iron containing a notable quantity of manganese (as was the fact in those used first in Sweden); but it is not at all probable that Kelly would have discovered what was necessary to perfect the process, as he had no knowledge of spiegeleisen (in 1857 no iron was known in the commerce of America by that name), and was not a chemist or an employer of chemists—but, judging from the fact that Bessemer availed himself of the aid of chemistry at an early day in his investigations, it is not at all improbable that he would have himself discovered the value of spiegeleisen had not Mushet anticipated him. I think all the facts warrant the naming the discovery the Bessemer-Kelly Mushet Process; but as Bessemer, by his ingenuity, persistence in methodical endeavor, and business sagacity, is clearly entitled to the first place, and if the process is to bear but one name, the popular verdict of over 30 years is fully justifiable in calling it "The Bessemer Process."

While we are thus considering the relative merits of the chief actors in this metallurgical drama, it is but just that we should award due praise to Martien, the American, and Parry, the Englishman, for ideas of great originality, which, had they been followed out to their logical conclusion, must have developed similar results to those attained by Bessemer. These metallurgists evidently were standing, as it were, on the "delectable mountains" of discovery, and seeing dimly and afar some suggestions of the practical glories of the metallurgy of coming generations.

The final summing up of the article in which the past and present conditions of the steel-making industry is contrasted is interesting:

Twenty-six years ago there were but two Bessemer converters in the United States, and it is not at all probable that in the year 1865 there were more than 500 tons of "Bessemer steel" made therein; but this germ product

has so wonderfully developed that in the year 1890 the total production of "Bessemer steel" in this country was 4,131,535 net tons, or 8,263 times the tonnage of 1865. This enormous output was made in 85 "converters," owned by 40 steel works, which were distributed in eight States, viz.: Massachusetts, New York, Pennsylvania, West Virginia, Ohio, Illinois, Michigan and Colorado.

In 1772 the American manufacturers' price for steel was equal to $186 66 per gross ton. Steel of better quality can be purchased of the American of to-day for $30 per gross ton, a decline of 84 per cent. in 119 years.

Twenty-seven years have elapsed since the first Bessemer steel was made in America, and that time, improved by the labors of skillful men from among our engineers, metallurgists and chemists, has wrought wondrous changes in the construction and management of our furnaces, steel works and rolling mills. To-day the tendency of all metallurgical manufacturing enterprises is toward concentration, not only in commercial and administrative affairs, but in their machinery as well. Giant engines, ponderous roll-trains, colossal hammers, crushing forging presses, stalwart cranes, furnaces whose "fervent heat" destroys all doubt of the possibility of the fusion of worlds, ore piles rivaling mountains in magnitude; enormous stores of coal, suggesting yet more enormous mines; a vast entanglement of railways to all parts of the works; a water supply sufficient for a town; miles of subterranean pipes bringing gaseous fuel to the roaring mills—are but the common details of a modern establishment for the manufacture of steel. Practices once condemned as criminal extravagances are now regarded as essential economies; things once deemed impossible by men of our fathers' time are but the familiar occurrences of to-day. Buildings, machinery, methods, have all been touched by the spirit of progress. Science has become better acquainted with art, and art has a better appreciation of science, and their united force are marching forever forward. Before their steady advance difficulties vanish, obstacles are surmounted, and seeming impossibilities are overcome; sound principles are established in place of empiricisms, and educated skill replaces laborious ignorance. Verily, "old things are passing away and all things are become new."

WORLD'S FAIR NOTES.

The Art Palace on the Lake Front park, which will be built by the Art Institute, assisted to the extent of $200,000 by the Exposition company, will cost about $700,000. The designs and plans of Shepley, Rutan & Coolidge, of Boston, have been adopted. During the Exposition the building will be used by the World's Congress Auxiliary for some of its numerous meetings.

The great imitation coast-line battle-ship, which is to constitute and contain the government's naval exhibit, is in an advanced state of construction. It will be all inclosed before Winter weather sets in and all of the interior work will be completed by Spring.

E. R. L. Gould, the American delegate to the International Statistical Institute, recently held in Paris, writes to Chief Fearn saying that the congress has accepted an invitation to meet in Chicago, in 1893.

Thomas A. Edison, the famous electrician, has applied for 35,000 feet of space, or about one-seventh of all that the Electricity building contains. "I have it from Mr. Edison himself," said Chief John P. Barrett, "that his display at the Fair is to be the greatest achievement of his life. In talking of his application for space, Mr. Edison admitted that he was asking for a large section of the building; 'but every inch will be put to good purpose,' he added. 'I shall not waste a foot of the area assigned to me, but will present a series of the most interesting electrical inventions ever produced.' I happen to know," Professor Barrett added, "that Mr. Edison is doing just as he says. He is making an almost innumerable list of novel and spectacular exhibits. Other electricians are not idle. We are already crowded for space in our building, and if the demand continues as it has begun, I don't know how we will accommodate all the exhibitors."

Customs regulations for foreign exhibits to the Fair are being prepared by Assistant Secretary Spaulding, of the Treasury Department. These regulations are substantially the same as were asked for by the foreign commisioners who recently visited Chicago. Mr. Spaulding says that he has no doubt that the regulations will be found entirely satisfactory to foreign exhibitors.

The number of intending exhibitors who have applied for space at the Exposition reached 1,623 on October 24. This is a much larger number than the Centennial had at a correspondingly early date. The number does not include any foreign applications, all of which are made to their respective national commissions.

Seventy-four cases of relics of the Indians and Mound Builders, have been received by the Department of Ethnology of the Exposition from Chillicothe, O. They contain a great variety of prehistoric implements and utensils, such as axes, arrow-heads, pipes, bowls, jars, etc. They were exhumed by a party acting under the direction of Chief Putnam.

Mrs. Potter Palmer is to drive the last nail in the Woman's building. The lady managers of Montana, at the suggestion of Mrs. J. E. Richards, are having the nail made of gold, silver and copper. It will be forwarded to Chicago as soon as completed.

Sir Henry Wood, the British Commissioner to the Exposition, who recently visited Chicago, has made a report to his government. The cable dispatches report that it is very elaborate, that it is about 10,000 words in length, and deals with a great variety of details concerning the Exposition. Subjoined to the report are plans and descriptions of the grounds and buildings, the regulations for installation, transportation, etc.; mail facilities, and other important data. In concluding his report, which is exceedingly favorable to the Exposition, Sir Henry Wood says that he has no doubt whatever of its ultimate success.

TAKE the I. O. O. F. excursion to Chicago, November 16th. Train leaves 6:30 A. M.

SAMUEL AUGUSTUS FULLER.

A decided loss to the iron and steel trade, as well as to a wide circle of friends, occurred in the sudden death, October 23, 1891, of Mr. Samuel Augustus Fuller, General Manager and Treasurer of the Union Rolling Mill Company and President of the Condit-Fuller Company. His genial and familiar features are made the subject of illustration in the supplement, accompanying this issue. Mr. Fuller was born near Warren, O., April 8, 1837. When about ten years of age he came to Cleveland with his father, Augustus Fuller, who established a wholesale hat, cap and fur house. After qualifying himself for business, young Fuller entered his father's store as accountant, and at the age of nineteen he was admitted as a partner. In 1869, his excellent business abilities having been generally recognized, he entered the iron business, becoming Secretary of the Cleveland Iron Co. His intelligent study of the iron trade, his large capacity for work, and his superior executive ability soon made him a controlling factor in the business and amply justified his entering upon a more extended sphere of labor. In 1878 he went to Hamilton, Ontario, where he successfully operated iron works for a period of two years. In 1880 he returned to Cleveland, and, in company with several prominent iron consumers, he purchased the old Union Iron Works and formed the Union Rolling Mill Company, of which he was General Manager and Treasurer up to the time of his death. In 1881 he established the iron and steel firm of Condit, Fuller & Co., now the Condit-Fuller Co. Mr. Fuller was also largely interested in Wisconsin and Michigan mining properties, as well as in other enterprises, to the successful management of which he brought to a ripe experience, a keen and penetrating business judgment, and, above all, unimpeachable integrity. Pre-eminently public spirited, he was always to be found at the fore-front of every movement which looked to the advancement of the city of his choice. As a member of the Board of Aldermen, the Board of Trade, and the Board of Industry, he took a leading and influential part. He was twice married and was blessed with twelve children, ten of whom survive him.

Genial, sympathetic, companionable, he won the hearts of all who came in contact with him, and it is doubtful if the death of any other citizen of Cleveland would have caused a feeling of such universal regret as did his.

At a recent meeting of the directors of the Union Rolling Mill Co., his son, Mr. H. Arthur Fuller, was elected Secretary and Treasurer—an admirable selection.

Electrical Appliances in a Mill.

There are now in use in the South Chicago mills of the Illinois Steel Co., two electrical appliances which are of considerable interest. One is an automatic recording apparatus, by which the number of rails rolled is duly recorded. The recording instrument itself is a very simple counter, but the manner by which it is actuated is very interesting, especially when it is remembered, that this end of the apparatus must be in close proximity to a hot rail. The conditions under which it operates are therefore very severe. As the rails pass from the saws, they strike a small lever, which is thereby moved out of its normal position, and this actuates a contact piece within a case, which thoroughly protects the apparatus from the heat and moisture. The electric circuit is carried from this contact mechanism to the recording instrument, and in this way the record can be easily read at any time. The other apparatus is a printing telegraph system, by which men at the reheating pits can inform those at the finishing end of the mill as to the heat numbers of the ingot, the ingot numbers, the number of rails to each ingot, so that the proper number may be stamped upon each rail that leaves the mill. In addition to these numbers, the "pit" and "hole" numbers are also dispatched. This mechanism is, of course, somewhat complicated, but it has done its work very satisfactorily. The transmitter is in charge of one of the men at the reheating pit, and the receiving instrument is in charge of a boy, who reports on a blackboard for the use of the stamper, the numbers and letters as they are printed on the tape by the receiving instrument. The distance between the two is about 350 feet.—[Railway Review.

Test of Fire Proof Materials.

A test of fire-proof materials was conducted in Boston, on October 15, in the presence of a large number of persons especially interested. A building was constructed for the purpose in a vacant lot, the interior being divided into seven rooms, each about 5x15 feet in area, and lined with fire-proof material. The material was put on by a number of manufacturers, each of whom protected the interior of one of the rooms according to his ideas of fire-proof construction, some using plaster, others fire-proof paper, others specialties of their own make. The entrance to each room was protected by a fire door, tinned on one side and the edges. There was also an opening in the roof of each room. Inside of each there were suspended four links, one of lead, melting at 626 deg. F.; one of antimony, melting at 842 deg.; one of aluminum alloy of 1,292 deg., and one of brass melting at 1,850 deg. F. The experiments were under the supervision of C. J. H. Woodbury, C. H. Goddard, O. S. Lord, and C. H. Rutan. About a quarter of a cord of dry hickory wood was placed in each room, and about half a cord in an effective position near the building. This wood was soaked with oil and the fires lighted. The fire burned nearly an hour before the building itself began to be consumed. By this time three of the links in each room had melted, showing that the temperature in each had risen above 1,292 deg. Later all the links melted, except one brass link in one of the rooms. In one hour and forty minutes after the fire was started the hose was turned on, and when the fire was wholly extinguished an examination of the building was made. It was found that all of the fire-proof materials used in the test had stood the experiment very well, but that some of the plastering had fallen, in cases due to the wooden backing being charred and thus leaving the plaster without support.—[Railway Review.

LAKE SUPERIOR MINING NOTES.

As announced in the *Mining News*, a week or two ago, a meeting of the stockholders of the Buckeye Iron Mining Co. took place at Menominee, the 27th ult. The meeting was for the purpose of reorganizing the company, under the laws of Wisconsin, and reducing the capital stock to $500,000. After a short session the meeting adjourned until the next day, and Marinette, Wis., was designated as the place for holding it. At the adjourned meeting all contemplated work was done, and the name of the organization changed from the Buckeye Iron Mining Co. to the Buckeye Mining Co., dropping the word "Iron." As soon as all the stock is called in, another meeting will be held and officers elected. Work at the Buckeye will be prosecuted with the utmost vigor during the coming Winter. The principal stockholders present were Edward Schofield, W. D. Ingersoll and W. W. Noyes, Chas. Noyes and Chas. Hallett, of Florence, and H. D. Fisk, of Iron Mountain.—[Florence Mining News.

At the Eureka a fine body of high-grade ore has been cut with the diamond drill, and the company figures that the property will prove a valuable one.—[Ishpeming Iron Ore.

The miners in the Hamilton tapped what seems to be a large body of water, a few days since.—[Ishpeming Iron Ore.

The diamond drill being operated by the Jackson Iron Co. to the northwest of their office, cut 10 feet of hematite, last week, at a depth of 545 feet from surface. The drill ran out of the ore, but it will be kept in motion until more is learned of the formation at that point.—[Ishpeming Iron Ore.

Mr. Geo. Wagner, who is exploring upon lands belonging to the Ross estate, on the southeast quarter of section 16, town 46, range 26, this county, has found hematite ore at a depth from surface of 40 feet.—[Ishpeming Iron Ore.

The Cleveland Cliffs Co. is energetically exploring lands belonging to them in the northern part of the city. Work has been commenced for the third drill hole on the new location, the pipe being down in the drift about 40 feet, the ledge not having yet been struck. The shaft that is being sunk a short distance to the north of this is down 52 feet, and has not yet found the ledge.—[Ishpeming Iron Ore.

The force of men at the Glidden property, the *Diamond Drill* is informed by Capt. William A. Morrison, under whose able supervision the work is being conducted, has been cut down to three men. The men will spend their time test-pitting, and preparing for a close of operations until the opening of Spring, when, everything in readiness, the rich deposit of ore which has been located will be mined on an extensive scale. There is no reason to doubt that the Glidden will develop into one of the richest mines in the Crystal Falls district.—[Diamond Drill, Crystal Falls.

At the Foxdale, a property near Humboldt that Ishpeming parties are engaged in developing, some remarkably fine ore is now being taken out of the shaft that they are sinking. The shaft is down 61 feet, the last five feet being in ore, and if the deposit proves of the same grade as the samples taken from the bottom of the shaft that the *Mining Journal* has been shown, the Foxdale will yet rank high in value. The ore is identical in appeaaance with the best Republic Bessemer, and is apparently entirely free from seams of rock.—[Marquette Mining Journal.

There is said to be fully 400,000 tons of ore in sight at the Mansfield. This property is a bonanza.—[Florence Mining News.

The Biwabik Co., operating on the Mesaba, are reported to have commenced explorations on another tract of their land a few miles west of the Biwabik.—[Iron Journal, Tower, Minn.

COMPARATIVE IRON AND STEEL STATISTICS.

The German professors Juraschek and Lexis have just compiled some interesting statistics concerning the production and consumption of iron, from which we gather that the total pig iron output of the world in 1840 amounted to 2,900,000 metric tons of 1,000 kilos. (the British ton equals 1,016 kilos.); in 1860 the figures had increased to 7,360,000 tons; in 1870, 12,095,000 tons were produced; in 1880, 18,385,000 tons; and in 1890, 27,146,000 tons. The output since 1860 has, therefore, nearly quadrupled, a result mainly due to the augmented production of Great Britain, the United States and Germany; these three countries combined were credited in the year 1890 with 81 per cent. of the world's output of pig iron. The comparative production during 1890 is given as follows; Great Britain, 8,001,000 metric tons; United States, 9,348,000 tons; Germany, including Luxemburg, 4,637,000 tons; France, 1,970,000 tons; Austria-Hungary, 925,000 tons; Belgium, 782,000 tons; Russia, 667,000 tons; Sweden, 421,000 tons; Spain, 232,000 tons; Canada, 26,000 tons; Italy, 13,000 tons; New South Wales, 4 000 tons; Switzerland, Portugal, Norway and Turkey, 25,000 tons; Japan and other countries, 95,000 tons. In the year 1889 Great Britain, with a total of 8,456,000 tons, stood at the head of pig iron producing countries, the United States coming next with 7,726,000 tons; in 1890 positions were exactly reversed, the United States ranking first last year with an output as already shown of 9,348,000 tons, compared with Great Britain's 8,001,000 tons. With respect to finished iron, two products—namely, welded iron* and steel, occupy the most important place. The world's production of welded iron in 1890 amounted approximately to 8,852,000 metric tons, and of steel to 12,141,000 metric tons. These totals are distributed among the various countries as follows: Of welded iron, Great Britain turned out 1,954,000 tons; United States, 2,558,000 tons; Germany, 1,454,000 tons; France, 823,000 tons; Belgium, 507,000 tons. Of steel, Great Britain produced 3,636,000 tons; United States, 4,345,000 tons; Germany 2,161,000 tons; France, 566,000 tons; Belgium, 236,000 tons, and Austria, 441,000 tons. The output of steel during recent years points to a great development compared with welded iron, owing, no doubt, to the improved processes of producing the former metal, and to the increased demand for machinery, railway and shipbuilding material. The following table illustrates the comparative consumption of pig iron during the periods mentioned:

PIG IRON CONSUMPTION.

	Average, 1880-1884		1889	
	Total, metric tons.	Per head, pound.	Total, metric tons.	Per head, pound.
Great Britain	4,275,000	266.2	7,815,000	449.9
United States	4,674,000	193.6	7,840,000	284.9
Germany	3,182,000	154	4,373,000	202
France	2,164,000	127.6	1,662,000	95 5
Belgium	532,000	206.8	1,073 000	393.4
Austria-Hungary	746,000	44	941,000	51

It will be seen that the consumption in all the countries named, France alone excepted, has made considerable progress of late years.

*According to the classification adopted by the International Congress held in Philadelphia in 1876, iron is officially distinguished in Germany in two classes only, without regard to its power of hardening—namely, welded iron, not having been fluid in production, as puddled iron and puddled steel; and ingot iron, the latter being produced in a fluid state, as Bessemer, Thomas and Martin steel, crucible steel, etc.

New Speed Indicator.

A simple form of speed indicator for locomotives has been designed in Germany. It is offered as a substitute for some of the apparatus of this class now in the market, and though less accurate, its simplicity is thought to recommend it. The device comprises a clock dial with two index fingers, the dial being divided into ten equal parts. One of the index fingers is driven by ordinary clockwork, and makes one complete revolution per minute. The other index finger is in communication with one of the driving axles of the locomotive through a system of bevel wheels and an endless screw and worm wheel. The proportions adopted are such that the index makes one revolution for every kilometre passed over by the engine. Each division on the dial, therefore, corresponds to a hectometre, or about 328 feet. The indications of the two index fingers thus afford a ready means of determining the rate of speed of the locomotive, and a comparison of their speeds over the clock dial enables one to make, at a glance, at least a rough approximation to the engine's speed. If both index fingers travel over the dial at the same speed, then the speed of the locomotive is exactly 64 kilometres per hour. If the minute hand moves more quickly than the other, the engine speed is less than this. If, however, the distance index moves more quickly than the minute index, then the engine speed is greater than 60 kilometres per hour. The apparatus is said to have given good results in recent trials.

A Scotchman's High Opinion of American Plate Rolling.

The 119 inch plate mill of Carnegie, Phipps & Co., of Homestead, turned out for the month of October the enormous amount of 4 800 tons of finished plates. This record was only once excelled. In the month of October, 1890, 5,200 tons was the finished product credited to the mill. At the present time there was no extraordinary effort made to strain at or break records, the crew worked along at a regular pace and did not aim above the mark.

A gentleman connected with steel works in Scotland, visited the Homestead plant Monday. Of his visit he said: "If I were to go back to Scotland, and tell them there what I have seen to-day, they would tell me very quickly that I was 'gaffing' them. You roll just four plates while we roll one in the old country. Another important thing is that you need not get your steel so hot as we do at home. You must know that in our plant we use soft rolls, and it is absolutely necessary to bring the steel to the rolls with a dripping heat, so that no foreign particles may cling to the surface of the ingot and thus indent the rolls. It is also necessary to scrape the bottom of the ingot or slab before it is pressed through the rolls. There is no use denying the fact, you Americans have left us far behind in the iron and steel mills."—[Pittsburgh Despatch.

Cost of Operating Electric Cranes.

The following facts and figures relative to economy of working the electric cranes on wharf in London are of interest. Formerly there were on the wharf a 10-ton steam crane, a two-ton steam crane and two 30-cwt. hand cranes. The cost of coal for driving the two steam cranes only was $1,250 per year, steam having to be kept up night and day. All four of these cranes were fitted with electric gear, and a dynamo with all necessary wiring, switches and safety fittings was put in, the total cost being $1,500. A gas engine used for chaff-cutting, drives the dynamo, and the cost of the gas for the whole of the work—cranes, chaff cutter and corn crusher, besides an ordinary friction hoist—is given as $280 for the year, while the amount of the work done has been considerably in excess of any previous year.

The English Iron Markets.

Our English correspondents, S. W. Royse & Co., of Manchester, write under date of October 24: "The expectations that prevailed at the end of last month as to the probability of better things during October have not been fulfilled. Most metals have declined in value during the present month, though only to a slight extent in some cases. Prices of pig iron have not fluctuated seriously, the total decline during the month being only a few pence per ton, and an improvement in business is expected as freights are advancing. The manufactured iron trade is in a fairly good state, and the tendency seems to be towards improvement."

IN some recent experiments on the strength of steel at various temperatures between 20° and 600° C., it was demonstrated that the elastic limit of the material became lower as the temperature rose, though the falling off was not very serious up to 200° C., but beyond that point it lowers somewhat rapidly, and finally seems to disappear. The maximum stress decreases from 20° C. up to 50° C., but afterwards rapidly rises to a maximum somewhere between 200 degrees C. and 250° C. Taking the strength of the specimen at 20° C., the maximum stress for the 23-ton steel is 1.34 greater and the maximum breaking stress is 1.62.

NEVEGOLD'S HORIZONTAL AND FLATTENING ROLLS.

The rapid introduction of the cotton-tie business into the United States renders of much interest a description of Nevegold's Horizontal and Flattening Rolls (herewith illustrated), letters-patent for which were issued October 6, 1891. The style of groove shown was gotten up to roll cotton ties, especially in the South, from cheap cold short iron. This groove creates an amount of friction on the iron, and that, the inventor claims, is the "medicine" for spongy, cold short iron. The range of work of which these rolls are capable, however, is much larger, as will be evident from the succeeding description. One of the most novel features is the horizontal edging, particularly in the rolling of wide sheets, and the kneading process on narrow strips. Practical tests of these processes have been made by the Supplee Steam Engine Co., of Columbia, Pa. The inventor, Mr. Fred Nevegold, has had a large experience as a hoop roller, and for ten years has been a hoop manufacturer, in fact, the first successful one in the East. For a number of years he has been running a hoop machine of his own invention, at Bristol, Pa. Full details of the horizontal edging and flattening rolls are given in the subjoined extracts from the patent papers:

"Fig 1 is a front elevation of my improved metal-rolling mill. Fig. 2 is a side view thereof. Fig. 3 is a vertical sectional view. Fig. 4 is a detail. Fig. 5 is a diagramatical view illustrating the reduction of a bar in rolling.

"My present invention is an improvement in metal rolling mills and in the flattening and edging rolls, thereof; and its object is to thoroughly work and compress the metal equally and on sides during the rolling thereof, and to so construct a pair of rolls that they will draw in a rod or bar of metal of larger cross-sectional area or greater diameters, both vertical and lateral, than the reducing-openings between the rolls; or, in other words, will compress the bar in rolling both laterally and vertically on all sides.

"Another object of the invention is to construct the rolls without grooves, thereby lessening the cost of making and finishing the rolls, and to make the rolls in each pair alike or use duplicate rolls to make a pair.

"Another object is to so make the rolls that they can be adjusted toward or from each other, so that they can be used for rolling and delivering bars of different thicknesses or of any cross-sectional area varying from a cube to a skelp.

"Another object is to provide improved means for preventing the longitudinal displacement or separation of the rolls by the wedging force of the incoming metal during the rolling thereof and to strengthen the frame or housing of the rolls.

"These objects I attain by the novel construction of the rolls and of the housings, as will be hereinafter clearly described and claimed.

"Referring to the drawings by letters, A B designated the upper and lower rolls, which are similar in form, but are set oppositely each other. Roll A has a shaft *a*. Near one end journal thereof is formed an enlargement or flange C, adjoining which is a second flange of larger diameter D, and adjoining flange D is a third flange E, of yet greater diameter. The roll might therefore be described as a deep angularly-stepped cone. Roll B has similarly-formed flanges C′ D′ E′. It is set below roll A and opposite thereto, so that flanges E′ and C, D′ and D, and C′ and E of the respective rolls are opposite each other, and the faces of flanges E′ and D′ are opposed to and partially lap the faces of flanges D E, respectively, as shown, thus forming a closed reducing-opening Z between the rolls, the top and bottom of which are formed by the peripheries of flanges D D′ and the sides thereof by the sides of flanges E and E

Fig 1

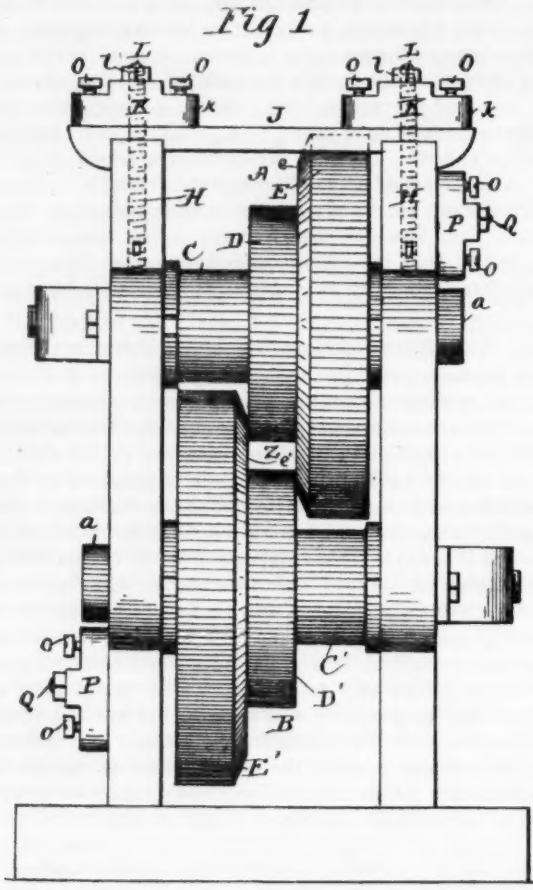
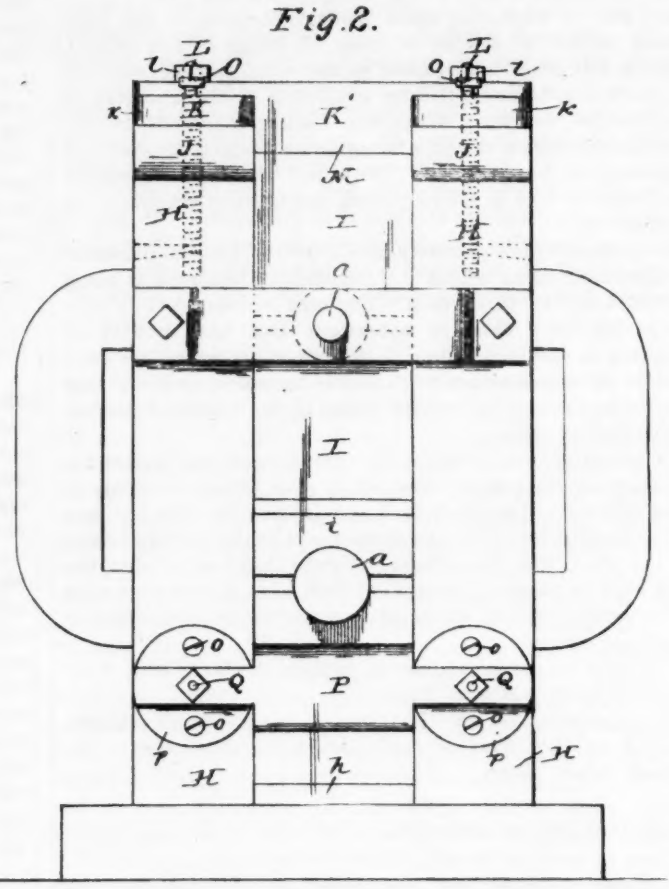


Fig. 2.



NEVEGOLD'S HORIZONTAL AND FLATTENING ROLLS.

Now it will be seen from the drawings that the flanges are of such depth that the rolls can be adjusted toward or from each other to "flat" or to edge the metal, or so as to almost make the faces of flanges D D′ meet, thus making opening Z of greater width than height, or the rolls can be separated, so as to make the opening cubical or even of greater height than width without making any change in the "finning" of the metal during the rolling operation—that is, the spaces where the "fins" might be produced in rolling metal are not varied in width by the adjustment of the rolls.

"The most important feature in the construction of my rolls lies in the peculiar transverse sectional form of flanges E and E′, by which the lateral compression of the metal will be produced. It will be seen that these flanges are not rectangular in cross section; but the inner faces thereof are partially tapered near the periphery, as indicated at *e e′*. In other words, the inner faces of flanges E E′ are parallel and at right angles to the axes of the rolls until they overlap or pass the faces of flanges D′ D, when they are beveled outwardly or tapered, so that they diverge, and the distance between the peripheries of the opposed faces of flanges E E′ is greater than the distance between the bases and parallel sides thereof. Now, of course, by this construction a bar of greater lateral section than the opening Z could be partially inserted between flanges E E′ of the rolls. The flanges revolving with the rolls, the beveled edges *e e′* thereof act to compress the bar laterally, as indicated by the arrows in Fig. 5, and at the same time the peripheries of flanges D D′ act to compress the bar vertically, so that by the time the end of the bar reaches the opening it is compressed to pass therethrough and is reduced in cross section. In other words, the beveled portions *e e′* of flanges E E′ cause the two rolls to have the same compressing effect on the metal that is effected ordinarily by the employment of four rolls—that is, two vertical and two horizontal—and the flanges E E′ therefore not only serve to guide the bar to the opening, but to compress it laterally, feed it inward, and work the metal by a kind of shear action thereon, as the faces of the flanges E E′ travel faster than the peripheries of flanges D D′, and the faces of bevels *e e′* of flanges E E′ travel faster than the portions of said flanges which constitute the sides of opening Z. The metal is thus compressed on all sides and given a torsional twist or pressure previous to reaching the opening Z, as the faces of flanges E E′ move faster than the metal can pass through the opening, and tends to force one side of the metal bar up and the other side down. These complex but actual simultaneous series of compressions produced on the metal insures its infeed and its thorough working, and tends to prevent finning, and the faces of the flanges E E′ at the outgoing side of the mill serve to dress down or planish the rolled bar.

"I have illustrated rolls for rolling bars angular in cross-section; but it will be apparent that the rolls can be constructed for rolling cylindrical bars, but when so constructed could not produce but one size of bar perfectly cylindrical in cross-section, though the lateral compressing effect on the metal would be produced by beveling the edges of the opposed faces of the flanges, as described.

"It will be observed that the spaces or meeting edges of the roll-faces are all at angles to the axes of the rolls, and they must be at right angles to the axes of the rolls in order to permit variations of the size of opening without varying the fin-spaces. It will also be observed that a line drawn between the meeting edges of the rolls at the opening Z would intersect such opening diagonally and at an angle to the axes of the shafts, and the lateral compression of the bars produced by flanges E E′ is not transferred to the journal bearings of the rolls, but instead will tend to wedge the rolls apart longitudinally, and hence

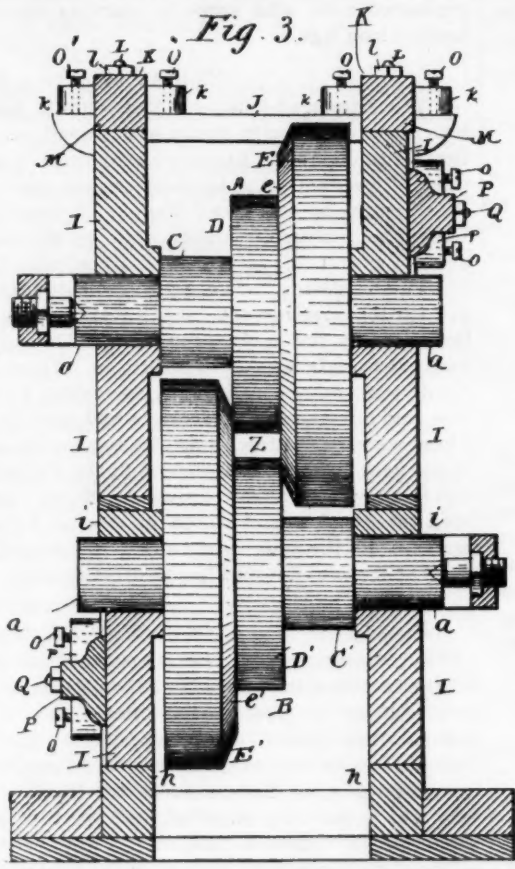
it becomes absolutely necessary to prevent longitudinal movement of the rolls in relation to each other, and this I have provided for by my improved housings, which are constructed as follows:

"H H designate the opposite uprights of the housings, I I the journal-boxes of the rolls, and J J are heavy metallic top bars connecting the opposite uprights H H at opposite ends of the rolls, all constructed about as usual, the uprights being firmly secured to a suitable basis. The lower boxes are supported on blocks or washers *h h* and the upper and lower journal-boxes separated by washers *i i*, and by changing the number or thickness of these washers the rolls can be adjusted toward or from each other.

"K K designate double cap-pieces, having enlarged heads or ends *k k*, which rest upon the ends of bars J J, and through which the securing bolts L L project, and the nuts *l l* thus bind the jars J and K to the uprights. The cap-pieces extend between and above the adjoining side uprights H and the intermediate portion M of the cap-pieces is thickened so as to depend between the bars J and bear upon the tops of the upper boxes I I, so as to prevent upward movement of the latter. Adjustable set-screws O O are tapped through suitable openings in the heads *k* at each side of bolts L, and by tightening these screws the cap-pieces can be firmly locked in position. The screws simply impinge against bars J.

The longitudinal thrusts on the rolls is, of course, in different directions, and in order to relieve strain on the boxes I employ bars P P, similar in general construction to pieces K. One of these bars P is secured to the uprights H opposite the larger end or flange E or E′ of the rolls exterior to the boxes, being secured to the uprights by means of bolts Q, which are tapped through transverse lateral openings *q* in uprights H, and their outer threaded ends project through openings in the heads of bars P, and are securely nutted, as shown, so as to lock the bars to the upritghs, and the central portion of each bar is thickened, as at *p*, so as to press directly against the adjoining journalbox near the roll shaft, and thus will effectually relieve strain on the roll. The heads *p* are also provided with adjusting screws *o o*, by which the bars can be trued, and, further, by means of these screws the position of the bar is regulated so that the bars cannot be drawn to the uprights so much as to cause the faces of the flanges of the rolls to unduly bind, but can be so regulated that the nuts on bolts Q can be tightened firmly without affecting the positions of the rolls. Of course, by this means the longitudinal thrust on the rolls is transferred to the uprights through bars P P, instead of through the connections of the journal-boxes. Ordinary adjusting bolts may be provided at the sides of the mills opposite the respective bars P to facilitate the longitudinal adjustment of the roll-shafts, as no strain is put on such bolts.

Fig. 3.



NEVEGOLD'S HORIZONTAL AND FLATTENING ROLLS.

"The mill may be provided with suitable guides for the metal bars in rolling, as usual, if desired, although the peculiar formation of the rolls will serve to draw the metal in regularly and truly. In practice I propose to arrange a number of pairs of such rolls or a series of my rolling mills in a continuous train, as is generally done where it is desired to make the reducing operation continuous, and in such case the succeeding pairs of rolls are so arranged that the fillets in each succeeding pair of the rolls will prevent the formation of fins."

A New Anti-Friction Material.

As the outcome of a number of experiments with different materials in the bearing or step of a water wheel, it has been discovered that a bearing of wood pulp hardened in molds under enormous pressure would give very good results, and could be used under water without oil. Further experiments showed that it was greatly improved by the addition of a small quantity of graphite. The material thus made can be planed, bored, drilled or treated as can metal. Some capitalists who became interested, employed an expert to give the material a thorough test, and it has now been in use on a steam engine, a dynamo and a plant consisting of shafting, testing machines, calendering rolls, several frames of cotton spindles, etc., this plant having been run day after day, for some months, with no trouble at all, and no oil used on any bearing. It is said that the wear of the journal and the material forming the bearing is also very slight, and the friction is reduced about one-third in all cases where it has thus far been tested.—[Railway Review.

A New Steam Boiler.

The invention consists in passing air at a high pressure through a vessel containing heated petroleum or hydro-carbon fluids in such proportions as to produce a gas completely combustible in itself, which gas is exploded in a small chamber outside the gas generator. This chamber is connected by a stout pipe which descends through the water to the bottom of the boiler, and the whole of the hot gaseous products of combustion—*i. e.*, water vapor, nitrogen gas and carbonic acid gas—are blown into the water itself, by which the whole heat created by the combustion of air and hydrocarbon vapors is made to act directly upon the water and cause its rapid evaporation into steam, and the whole heat of the fuel is thus employed without any loss. The steam produced will have its expansive force augmented by the elastic force of the carbonic acid gas and nitrogen. Claims: The utilization and combustion of hydrocarbon gases and conducting the products of such combustion directly into and through the water to be vaporized.—[Industries.

IMPORTANT TO THE IRON ROOFING TRADE.

Last week a decision was rendered by Judge Sheilds, of Omaha, Neb., in a case which was carefully watched by the corrugated iron trade of the country, and the outcome of which has judicially established what are the lawful gauges of corrugated iron in the absence of any definite contract.

The plaintiff in the case was the Wheeling Corrugating Co., of this city, and the defendant C. Specht, of Omaha. The order from the defendant read as follows: "Ship me two hundred squares (200) No. 20 corrugated black iron roofing, painted." The Corrugating Co. shipped the two hundred squares of No. 20, as ordered. It weighed 153 pounds to the square, which weight was shown on the invoice. The defendant accepted the goods and used them on the Union Pacific freight station at Omaha, Neb., for which use they had been purchased. When the bill was presented he claimed a deduction on the ground that the material was not really No. 20 corrugated iron, but an inferior or at least a lighter grade. The plaintiffs brought suit to enforce their claim, and the question as to what really constituted No. 20 corrugated iron, came up for a legal adjudication.

Fig 5

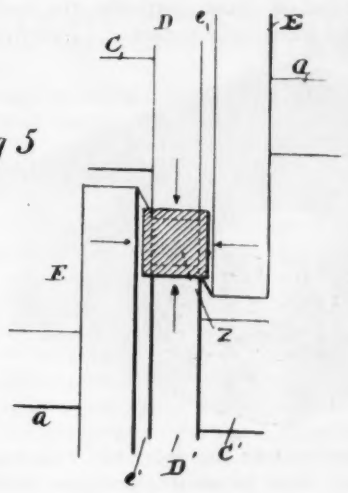
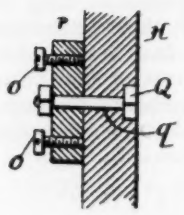


Fig 4



Before the court, Specht produced an 1889 catalogue of another company, which gave the approximate weight of No. 20 corrugated iron as being one hundred and eighty-seven pounds. The plaintiffs on the other hand by deposition and testimony of a number of the leading manufacturers, showed that the approximate weight of No. 20 corrugated iron according to the Birmingham gauge was 156 pounds, and that the Birmingham gauge was in use by a majority of the manufacturers of corrugated iron. Previous to 1887 there were several different gauges in use by makers of corrugated iron in this country. In that year the National Iron Roofing Association met and agreed upon what is known as the Birmingham gauge as a standard, to be used by all members of the association. The gauge thus adopted, was widely published at the time and since, and is fully set forth in all the catalogues of members of the association. Some few manufacturers refused to conform to this standard, but the greater number now use it. The weights are approximate, of course, as it is utterly impossible to roll sheets with the same exactness as potatoes may be weighed, for instance. In this case the deviation from the approximate weight was but 2 per cent., and a change of one thirty-second of an inch in the adjustment of the corrugating rolls would more than make the difference. The court held that the adoption by the National Association and ensuing wide publication of the Birmingham gauge was sufficient to establish it as a standard understood alike by buyer and seller in a contract, where no other gauge was expressly stipulated, and that the very slight difference between the approximate weight—expressly given as approximate weight in all trade catalogues—and the actual weight was but such as might reasonably be expected in rolling the sheets, and rendered a verdict in favor of the plaintiff.

The case was the first of the kind ever brought to trial, and throughout was closely watched by the trade of the country. It will of course establish a precedent for future cases in which there may be any dispute as to the standard gauges, and the fact that the Wheeling Corrugating Co. advertises the Birmingham gauge in all their catalogues, was a warning to their customers that all orders would be filled according to that standard.—[Ohio Valley Manufacturer, Wheeling, W. Va.

In order to determine cobalt or nickel electrolytically, it is necessary first to remove any iron which may be present. Mons. G. A. LeRoy effects this by bringing the metal into sulphuric solution, adding a very small quantity of a non volatile organic acid, preferably citric. There is then added a large excess of a concentrated solution of ammonium sulphate, rendered strongly ammoniacal. Under these circumstances ferric hydroxide is not precipitated

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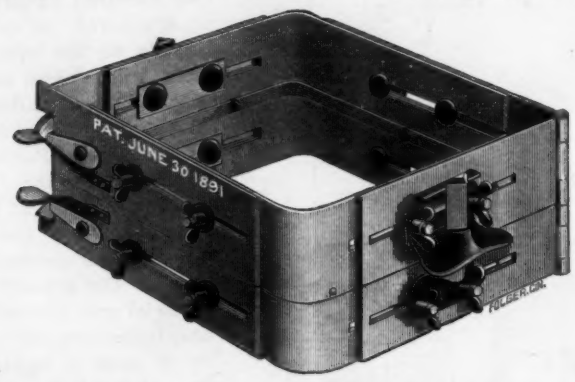
RICHARDSON'S ADJUSTABLE SNAP FLASK.

In this illustration is shown the new and much talked of Richardson's Adjustable Snap Flask. It is made of steel plate ⅛" thick, galvanized, it is almost indestructible and yet light in weight, and will not warp or rust. The flask can be adjusted from any size from 8x10 to 12x17 inches. The flasks are so hinged that they can be opened and still made so substantial that they will not shift or get out of order while in or out of use. In construction they are so simple that any boy can manipulate them perfectly after one trial. The saving by the use of this flask is at once made apparent. Every one who has



had anything to do with a foundry has seen the delay and annoyance caused by not having the proper size snap flask for some particular work. Besides being of great saving to the employer it is a boon to the molder, who, without leaving his bench, can adjust the flask to the desired size. The mode of adjustment is very simple, loosen thumb nuts on drag, place same over pattern, allowing as much margin as desired, then tighten the nuts, match drag with cope, tighten nuts on cope and the flask is ready for use. In matching drag with cope it makes a perfect adjustment of pins either tight or loose as the work requires. When the nuts are tightened the pins do not shift. The J. D. Smith Foundry Supply Co., Cincinnati, O, are the general selling agents.

THE CRITICAL TEMPERATURE OF STEEL.

At the June convention of the American Railway Master Mechanics' Association, an official report of the proceedings of which is before us, the question, can steel be flanged safely at other than a red heat? was discussed. It is the rule in boiler shops to work steel at a red heat, but it is more than probable that all do not realize the danger incurred when this rule is not closely followed. This danger was illustrated by two samples of open-hearth steel shown by Charles Blackwell, of Shoenberger & Co., of Pittsburgh. One end of each piece had been doubled over cold. The closest inspection failed to discover any signs of distress. The central portion of each piece had been twisted when red hot so as to resemble a corkscrew, and, as might be expected, there were no indications of failure. The other end of each piece had been bent at a temperature of about 600°, or that corresponding to a blue color on the surface, of from which the scale had been removed. Each piece was badly fractured at the center of the bend. Cherry red is the last visibly recognizable degree of heat before the metal becomes black, and has been recommended by the American Boiler Makers' Association as the limit at which all work should stop. Iron as well as steel is subject to this dangerous condition at about 600°. J. N. Lauder, of the Old Colony Railroad, said: "All steels that I have ever made any experiments with are brittle at a temperature that will produce a blue color when brightened. I have tried many experiments with the best Otis fire-box plate and found in every case that although while cold it would double down and hammer down under a trip hammer without a sign even of distress, at the blue temperature it would break invariably." Pulaski Leeds, of the Louisville & Nashville road, said he believed there was a danger point in heated steel, and he did not advocate the use of steel axles for the reason that they quite often get to this temperature. When heated to this degree the least vibration will produce a flaw. He stated that an examination of broken crank pins and steel axles would almost invariably show a fine flaw, perhaps the size of a half section of a silver half dollar, that is apparently old, the rest of the entire axle being bright, clear and fine-grained steel. It had always been his opinion that those flaws had been produced at the time when the metal had reached the dangerous temperature, caused by a hot journal or something of that kind. He thought vibration was necessary in order to produce hurtful effects.

James Meehan, of the Cincinnati, New Orleans & Texas Pacific road stated that he had seen some specimens of basic steel tried under all circumstances and all temperatures without developing any fracture. This, he was inclined to think, was due to the fact that phosphorus is so thoroughly eliminated in basic steel that it will not be subject to the defects under different conditions that carbon steel is.

It is difficult to overestimate the importance of this subject. Although it was brought before the American Society of Mechanical Engineers some years ago, the fact that steel is brittle at a certain temperature was not forcibly impressed upon those working steel. The matter has been investigated by experienced men, who agree in warning against any working during the blue heat.—[Iron Age.

Railroad Machinery for Brazil.

The Bureau of American Republics is informed that since the promulgation of the reciprocity treaty with Brazil, 128 locomotives have been sold in that Republic by the Baldwin Locomotive Works of Philadelphia, and in addition to this number 24 locomotives are now being loaded at Philadelphia for Brazil on the barkentines "Maggie Thompson" and "Eleanor M. Williams." Under the reciprocity treaty with Brazil locomotives and railroad supplies generally from the United States are admitted free of customs duty.

The Brazilians have always preferred American locomotives, and our sale of both locomotives and rolling stock will probably be greatly increased in the future by the reciprocity treaty. During the four months from April 1, when the treaty went into effect, to August 1, our exports of machinery to Brazil were valued at $874.104 as against $214,821 during the same period in 1890, and our exports of carriages and cars increased from $229,891 to $348,545. These were on the free list. Among goods on which there is a reduction of 25 per cent., when manufactured in the United States, the exports of hardware and tools increased from $56 466 to $88,205; and lumber and wood manufactured increased from $107,678 in 1890 to $320,776 this year. This shows an increase on the four items above mentioned of $1,058,774, or nearly 174 per cent.—[National Car and Locomotive Builder.

Will Want Car Material.

In prosperous times the railroad and car building trade is a profitable one for the lumbermen. Very few railroads have been able to declare their usual dividends for the past year or two without a great curtailment of expenses, and this has generally been effected by making the old rolling stock and bridges do another year, where such a thing was possible. But the immense quantities of grain to be moved this Winter has created a demand for more cars which must be supplied, and besides gives assurance of a profitable season for the railroad companies. Last year the demand for car and bridge material was very light, but will be correspondingly heavier next year, as railroad companies now feel justified in going on with improvements. This is only one of the many channels through which lumber finds a market; but it serves to illustrate the future prospects of the lumber trade in the West, and certainly indicates that recent advances which have been made in prices are only what the situation demands, and that these advances are less, rather than greater, than they should be.—[Timberman.

Chicago and Return, $6.00.

Patriarchs Militant I. O. O F., Cleveland Canton No. 33, will run an excursion to Chicago, via the Nickel Plate, Monday, November 16th. Train leaves 6 30 A. M., giving seven days to visit the city of the World's Fair. The American Fat Stock, American Live Stock, American Poultry and American Dairy Show will be held November 11th to 21st. Procure tickets from following members: G. W. H. Young, 903 Woodland avenue; J. A. Robinson, 52 Public Square; H. Cohn, 778 Lorain street; A. T. Van Tassel, 250 Detroit street; R. Mohrman, Minnesota and St. Clair streets; E. Slade, 1954 Euclid avenue; F. Freedle, 34 Scovill avenue; A. J. Spencer, Cataract House, Newburgh; E. A. Cobb, 1205 Cedar avenue; C. H. Cobb, 1377 Cedar avenue, and Nickel Plate agents.

Crude Petroleum Fuel.

A very successful experiment was made recently on the Manitou & Pike's Peak to burn crude petroleum in the locomotives. The apparatus consists of a single jet placed in the centre of the firebox pointing directly to an inverted firebrick arch. The oil is spread, as usual, by a jet of steam or air. The oil used is obtained in Colorado, and has little or no odor. As a result of these tests, it is probable that next year all engines on this road will be equipped with oil burners, and from the present indications there will be a decided saving in the cost of fuel and an absence of all smoke and objectionable gases.

NICKEL PLATE excursion to Chicago, November 16th. Tickets good seven days; $6.00 round trip.

PROTECTING YOUR BUILDING With an automatic fire sprinkler system makes it absolutely fire proof. All Insurance Companies recognize the "Neracher" as the best made and will make liberal reductions on your present rates if you equip. In this way the system pays for itself inside of two years' time.

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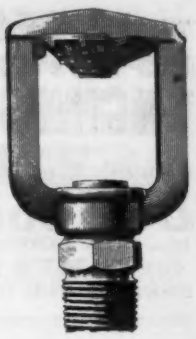

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A NEW FUEL GAS PROCESS.

In these latter years an important question comes up, viz.: while electric light will in time be of almost universal use in homes as well as all stores and other buildings, will the inventive genius of man devise a process, making a cheap gas which can not only be used as a fuel for all manufacturing purposes but for light, cooking and heating purposes in all places where gas will, to a great extent, take the place of coal, oil, and gasoline for all the purposes they are now used and can this gas be made and furnished, not only to manufacturers at a price so low that it may in time entirely take the place of coal and its many annoyances, but at a price so low that in hundreds and thousands of homes in the land it can come in to almost universal use? That inventive genius has been at work, and is devising means which will in the near future accomplish all that is so much desired in these mattters, by manufacturers and housekeepers and all others interested, is without doubt. Already more or less is being accomplished in that direction. A company has been formed in Pittsburgh, to manufacture gas for all purposes needed, the invention of a Mr. Rose. In experiments which have been made, with a few hundred pounds of coal and a small quantity of light colored oil, a fuel gas has been made of a strong heating power and giving a bright light, at a cost as claimed by the parties interested of 6¼ cents per thousand feet. While this process will do something in the desired direction, the machinery made use of in that process is somewhat complicated, and the inventor has made some changes, enabling him in his experiments to produce this gas at the cost named, being less than what was the cost before these changes were made. This process has attracted attention to such an extent, that a company has been formed to sell rights to make the same, and to furnish plants for any one needing it. Carnegie & Co., of Pittsburgh, have bought the right to make gas by this process, and will in time have it in successful use in all their factories. It is not known certainly to the writer that the purchase of this right includes the State of Pennsylvania.

The writer has seen an item in the papers that some one in the West by the name of Hall has invented a process of making gas, which is claimed, can be made out of garbage, if no other material can be had. So far as the writer knows, this process seems less complicated than the Rose. In this process the coal is crushed and converted into gas, but not any oil, as the statement says, being used. After being converted into gas, it passes through a series of electrodes and goes into the gasometer with very little, if any, odor, and, so far as may be known free from any poisonous elements. A company has been formed and offers to make, or has made, a contract to furnish gas to the city of Waukeegan, Ill., at a cost not to exceed 15 cents per thousand feet. If this is done and in good faith, quite an advance will have been made in this important item, and to the great advantage in every way to the people.

In referring again to the Rose process, the writer understands from the article published that, in the low cost they claimed to have made gas for, they feel that when all the changes will have been effected they may be able to make gas and convey it to the gasometer at a less cost than 6¼ cents per one thousand feet.

Inventive genius, however, has not ended in these few illustrations. Mr. W. H Harris, a practical mechanic and still a young man, gifted with quite a degree of inventive genius, has for some time been studying with a view to manufacturing a fuel gas at a less cost than by any other means thus far known. For some months he has been located in Maysville, Ky., carrying on his experiments in a quiet way and perfecting the same from time to time; and while they may not be entirely perfect in every particular, the tests made so successful, that descriptions and drawings were made and patents have been secured for his process in this country. The machinery made use of is more simple than that of the Rose or Hall process, and he is still at work on the same. He has quite a plant erected in Maysville to make gas on a good-sized scale, and a chemist is engaged in assisting in the work by making from day to day an analysis of the gas. Professor Payne, the chemist, is a graduate of Case School of Applied Science, Cleveland. Though still a young man has already had quite a valuable experience in his calling.

The writer has lately visited Maysville and inspected the process, and was very much pleased as well as instructed. He saw the gas burning in a moderate way in a small grate, giving penetrating heat. He also saw it in a gas burner, the light looked brighter than the ordinary gas. In the furnace it was used in making steam for running the engines. A new furnace is now completed containing improvements giving a more satisfactory test of the gas for fuel purposes.

In tests thus far made this gas is almost entirely free from any poisonous element, quite an important item for users. While the two other parties claim to be able to make a low price fuel gas, Mr. Harris's invention and process and the machinery used are so much more simple in every way, so far as can be seen, than that of Mr. Rose or Mr. Hall, that it is the feeling of all those interested in the matter that by this process a better and purer gas, for all purposes, can be made at a less cost than by any other process. In the Harris process the coal is all converted into gas and no by-products are left. In the Hall process there is some residuum of stone and slate left in the quantity of coal used. From what was seen by the writer on the occasion of his visit to Maysville, and from his conversation with some of the interested parties, by the Harris process a very high grade of fuel gas for manufacturing, lighting heating and cooking purposes can and will be without any doubt made and put into the gasometer at a less cost to the makers than by either of the other two processes named, and that in time it will be made and furnished to manufacturers for all purposes at a much less cost than any fuel now being used, and at a less cost than natural gas is now being furnished to them, with this important consideration, that while natural gas may in time fail them in many places where now being furnished and used there will not be in any danger of failure or loss of time to them in using this process for making their fuel gas.

To the courtesy of Mr. E. E. Wood I am indebted for the following description of the process:

"The plant consists of a generator and a fixing chamber, the generator is 3 feet inside diameter, and about 10 feet high. It is fed in charges of about 20 lbs. of coal once a minute, or a minute and a half; steam is also admitted into the generator; the proportions used are 50 lbs. of coal to 250 lbs. of steam, and for fuel gas 50 lbs. of hydrocarbon, naphtha or other light oils may be used. With 50 lbs. of naphtha to the above named amount of coal and steam, a highly heating fuel gas is obtained. For illuminating gas about one-half as much more light oil is charged. The gas holder is comparatively small, holding between 5,000 and 6,000 cubic feet; this small plant makes 1,000 feet of gas per minute. The estimated cost of gas is not over four cents per 1,000 feet for illuminating gas of 15 candle-power. The wonderful feature about this process is that it is continuous after the plant is once heated up. It does not have to be used intermittently as with most processes; the heat is maintained at the gas fixing point continuously. It is believed by engineers who have investigated it that fuel gas can be made from such a plant, and cities and towns supplied with it cheaper than natural gas can be piped long distances. The proprietors have offered to furnish Maysville with both fuel and illuminating gas at a price not to exceed 50 cents per 1,000 feet. There is an ordinance to that effect now pending. The present price of gas in the city of Maysville is $1 50 per 1,000. It is needless to say, however, that the old gas company is very bitterly opposed to the adoption of the new system.

"It is said by engineers who have experimented with the richness of this gas that at 50 cents per 1,000 it is cheaper for heating and cooking purpose than coal at eight cents per bushel, to say nothing of doing away with smoke, and avoiding trouble from ashes, cinders, stoves, etc. This enterprise is exciting a great deal of inferest. It is thought that it is a cheaper and better gas for steel making and steel furnaces than the gas made by the Siemens-Martin furnace. With some grades of coal fuel gas can be made without the use of light oils, but for illuminating gas light oil is necessary to make the proper amount of benzol vapor.

"Berthelot, and subsequently Dittmar, eminent French engineers, have ascertained that the addition of 3 to 3½ per cent. of benzol vapors added to marsh gas or fuel gas converted into a high illuminating gas. Frankland and Thorne, two eminent English engineers, by a series of experiments likewise determined that carbonic oxide could be converted into illuminating gas by the addition of 5 per cent. of benzol vapor. That fuel gas (marsh gas) would be converted into illuminating gas (92.45 candle power) by the addition of 3½ per cent. of benzol vapor. Some idea may be had of the cheapness of the process when it is understood that none of the products of combustion used in heating are wasted, but all reconverted into a combustible gas of greater or less in illuminating power, in accordance with the amount of benzol vapor, or light oil, added thereto.

J. P. G.

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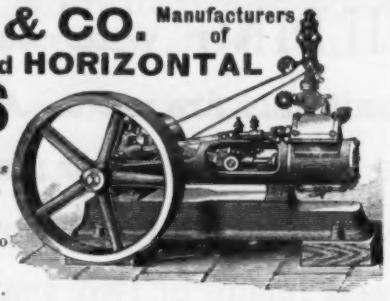

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INDUSTRIAL SUMMARY.

New Enterprises:—

Van Wagoner & Williams will erect two stone and brick buildings for the manufacture of hardware at Cleveland.

The Monterey Foundry & Machine Co. have been chartered to do business at Monterey, Mexico, and Hutchinson, Kan.

A company for the manufacture of electrical appliances is being organized in St. Paul. The capital stock is to be $100,000.

The R. S. True Co., of Syracuse, N. Y., has been incorporated, with capital of $15,000, to manufacture bicycles, tricycles, etc.

Wm. Sellers & Co., incorporated, will erect an addition, 80x78 feet, to their plant at Sixteenth and Buttonwood streets, Philadelphia.

L. S. Bonbrake proposes to establish a plant at Nebraska City, Neb., for the manufacture of steel roofing and other iron building materials.

The New York Frog & Switch Co. has been formed at Hoboken, N. J., with capital stock of $100,000. J. L. Nevin, A. A. Franck and M. P. Merseles are the stockholders.

The Paragon Manufacturing Co. has been incorporated at New Haven, Conn., with a capital stock of $16,000. The company will manufacture hardware, tools and specialties.

The Connell & Dengler Machine Co., capitalized at $100,000, have been incorporated at Rochester, N. Y. The object of the company is to manufacture and sell machinery and machinery supplies, and to operate a foundry.

The Standard Smoke Consumer Co. is a recently organized concern at Portland, Me. The company is capitalized at $150,000, and will manufacture and deal in machinery relative to its name. President, Theodore Pinkham; Treasurer, E. B. Hill.

The Washington Nut, Lock & Bolt Co., of Washington, Pa., has been granted a charter; capital, $10,000; directors, John E. Stewart, Midway; John L. Carson, West Alexander; E. A. Dunlap, Coon Island; J. W. Murry, W. I. Campbell, J. W. Hindmon and J. E. Allum, Washington.

The Inventors' Manufacturing Co., of Youngstown, O., have been granted a charter, with a capital stock of $1,000. The incorporators are: E. M. Taylor, C. E. Walton, L. T. Tyrell, B. F. Campbell and Fred C. Brown, all of Youngstown. The object of the company is to manufacture and sell novelties.

The D. B. Smith & Co. has been incorporated with $20,000 capital to manufacture all kinds of agricultural implements, at Deerfield, N. Y. The location of the principal office is at Deerfield Corners, Oneida county. The directors are as follows: Dewane B. Smith, Charles H. Poole, Edwin H. Risley, Thomas L. Benham, Robert B. Poole, all of Utica.

The Grant Machine Tool Works, of which R. H. Grant is Superintendent, and John J. Grant, General Manager, has been established at Fitchburg, Mass., occupying a building 100x30, with an annex for boiler and engine room. The works will manufacture steel balls for anti-friction purposes, and will soon bring out a high-speed grindstone frame and other specialties. Eventually a general line of machine tools will be produced.

A meeting of the parties interested in the establishing of a tinplate plant at Blairsville, Pa., was held recently. A committee was appointed to secure a charter. The following Board of Directors was also appointed: T. D. Cunningham, Jas. A. Graff, D. M. Fare, Paul Graff, J. M. Devers, J. M. Harvey and R. W. Werhle. It is said the new company propose to invest about $75,000 in the plant, and will give employment to a large number of hands.

The following are among the new charters of incorporation recently granted by the Secretary of State of Illinois: The McKenzie Equinomic Smokeless Furnace Co., of Chicago; capital, $250,000; incorporators, Dougal McKenzie, G. W. Haggett and S. D. Lansing.—The Premier Matrix Making Machine Co., of East St. Louis; capital, $500,000; incorporators, A. J. Kletzker, Estill McHenry and G. N. Scott.—The Acme Railway Switch Co., East St. Louis, to manufacture an automatic lock-geared railway switch; capital, $500,000; incorporators, J. E. Chambers, George Broach and Chas. E. Long.

San Diego, Cal., papers are excited over a "proposition of immense magnitude," which has been submitted by C. L. Hubbs, who is said to be a mine owner and the possessor of a large area of Arizona coal and timber lands. The scheme is to establish on the bay front at San Diego a plant for the manufacture of iron ships, including iron passenger vessels and merchantmen, and Government cruisers if contracts can be secured. It is proposed to convert the ore into pig iron at the mine, using coke as a fuel, and to ship it to San Diego where it will be converted into the manufactured product. The cost of the entire plant is placed at $3,000,000. It is further announced that associated with Mr. Hubbs is a company owning a plant at Pittsburgh, Pa., for the manufacture of locomotives, which it is proposed to move to San Diego, where the building of locomotives will be carried on on a large scale. In addition to all these enterprises the promoter also proposes to establish rolling mills at San Diego for the special manufacture of steel rails.

Additions, Enlargements, Removals, etc.:—

The Pair Point Manufacturing Co., of New Bedford, Conn., which recently built large additions to its factory, will put in engines and three large dynamos, and do electric lighting.

The Flenniken Turbine Co., of Dubuque, Ia., propose to enlarge their plant.

The Pittsburgh (Pa.) Bridge Co. will increase its capital stock from $100,000 to $200,000.

An addition, 48x100 feet, is being erected at the works of C. John Reily, Pittsburgh, Pa.

Work in the foundry department of the Ohio Falls Car Works, at Jeffersonville, Ind., has been resumed.

The American Foundry Co., at Edison, Wash., will erect a plant for the manufacture of car wheels of all kinds.

An addition, allowing of 800 feet more of floor space, is being made to the plant of the Holyoke (Mass.) Machine Co.

The Greenfield Boiler Co.'s works, at Greenfield, Mass., have been sold to Utica, N. Y., parties, to which place the plant will be moved.

Creswell's Iron Foundry, Philadelphia, Pa., is to be removed to a new site, where a two-story brick structure 190x70 feet is being erected.

Watson & Stillman, of New York, have recently added 5,000 feet to their works, thereby greatly facilitating the production of hydraulic tools.

The Gilbert & Bennett Manufacturing Co., of No. 148 Lake street, Chicago, Ill., wire netting, wire fencing, wire goods, etc., are erecting a new factory on West Sixteenth street, which is expected to be ready for occupancy on or about the first of January.

It is stated that Caleb Calvin, a well-known iron founder, at Worcester, has purchased the interest held by Henry C. Fish in the L. W. Pond Machine Co., also of that place. The old business will be continued. Work is progressing on the new building at the Calvin plant, and it soon will be ready for occupancy.

The Chester Valley, which includes Coatesville, Parksburg and several other iron-making towns, is one of the chief centres of the plate iron and steel trade. There is no steel plant there and all the steel that is rolled is made elsewhere. A large open-hearth steel plant is to be built at once by the Lukens Iron & Steel Co., of Coatesville, the largest concern in the Valley. The plant will contain six furnaces with all the necessary gas producers and appliances. Of the site now occupied by the mills of this company was built the first plate mill erected in this country. The present works consume about 1,000 tons of steel per week, and contain the largest plate rolls in the country, rolling plate 10 feet wide of any length.—[Philadelphia Record.

General Industrial Notes:—

The contract for the iron work of machinery hall at the World's Fair, has been let to Binder & Seifert, of Chicago, the amount being $350,000.

William Tod & Co., Youngstown, O., will furnish a Porter Hamilton engine capable of developing a thousand horse-power for the plate mill of the Riverside Iron Works, at Wheeling, W. Va.

In our issue of last week, we made an error in the article on the New Philadelphia Iron & Steel Co. We should have said the plant contained one fire bed mill and four mills for light sheets.

H. H. Walters, having retired from the firm of H. H. Walters & Co., dealers in emery wheels and fixtures and rubber supplies, the business will be continued by Chas. A. Cavagna, at the stand of the former firm, No. 107 West Second Street, Cincinnati, O.

The twelve-inch mill at Hubbard, O., broke all its former records on the 15th inst., turning out 65,560 pounds of three-quarter rounds. The puddling department also drew the largest turn ever drawn there, over sixty-two thousand pounds from twenty-one furnaces.

One firm recently ordered 18 large water-wheels of James Leffel & Co., Springfield, O., builders of the famous James Leffel wheel. A large wood pulp mill, now under construction in Wisconsin, will use these wheels. This new enterprise is situated near large quantities of suitable timber, and where ample water power can be obtained.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C. until 2 o'clock P. M., on the 24th day of November, 1891, for all the labor and materials required to put in place complete, the iron floor, ceiling and roof construction and iron columns for the United States Post Office, Court House &c., building, at Troy, N. Y.

The co-partnership heretofore existing between Daniel P. Hyatt, James H. Mathews and Albert P. Gahr, under the firm name of Hyatt, Mathews & Gahr, agents, iron and steel, pig iron, coal and coke, rooms D & E, Mitchell Building, Cincinnati, has been dissolved by mutual consent, Mr. Gahr, retiring. The business of the firm will be continued by Hyatt, Mathews & Co., agents.

The Maryland Steel Co., of Sparrow's Point, now has three of its furnaces in blast making an aggregate of about 600 tons of Bessemer iron a day. Its other furnace will probably be blown in as soon as the demand for steel rails justifies pushing production. These four furnaces, when in full blast and after

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they all get into good working trim, will be able to turn out 1,000 tons of iron a day.—[Manufacturers Record.

Tinplate manufacture is certainly to be given a fair trial on a sufficiently large scale to determine its possibilities. William Tod & Co., of Youngstown, O., informs us that they have the contract for engines of 1,500 horse-power capacity, for the American Tin Plate Co., at Elwood, Ind., and that the construction is well under way. All of the machinery for this mill is to be on the ground by the middle of February next.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C. until 2 o'clock P M. on the 20th day of November, 1891, for all the labor and materials required, for furnishing and putting in place complete, the low pressure, return circulation, steam heating and ventilating apparatus, for the United States Court House, Post Office and Custom House building, at Vicksburg, Miss.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 19th day of November, 1891, for all the labor and materials required to furnish and erect complete, three hydraulic passenger elevators, one hydraulic mail lift, one hydraulic ash-lift, including pumps, tanks, cars, platforms, piping, etc., for the United States Court House and Post Office building at Pittsburgh, Pa.

The *Moniteur Industrielle* recommends the use of a mixture of oil and graphite on all screws in machinery. It says, it will effectually prevent them from becoming fixed, and protects them for years from rust, at the same time the mixture facilitates tightening up. The Joseph Dixon Crucible Co., Jersey City, N. J., have for a number of years prepared graphite mixture, which have found great favor with machinists and steamfitters of this country. Dixon's graphite pipe joint mixture not only takes the place of red lead, but is said to be better, while Dixon's graphited oil is used where a thinner mixture is desired, and also for lubricating bearings. Graphite is claimed to be the best natural lubricant known.

Standard Steel Ties.

We have several times referred to the Standard steel ties which were placed in the track of the Chicago & Western Indiana Railroad in October, 1889, and remarked the durability of this track as demonstrated by the experience which is daily accumulating. Mr. John W. Clarke, the roadmaster who had charge of the track in which this section was laid, and under whose care it was until recently, when he left the service of the road, has lately made a report in which he states that the total expense on the stretch of 1,000 feet of steel ties during the 19 months between the time they were first put in, and when he left the service of the company, was but $45.00, and that the greater portion of this was caused by the first surfacing done after the track had been laid in soft ballast to bring it up to the same elevation as the track placed on wooden ties running parallel with it. "During the same time," says Mr. Clarke, "the cost of the labor alone for the 1,000 feet of track with wooden ties located alongside of the steel ones was $210 25. This was enough saved in labor alone to purchase 65 new steel ties, and, I think, demonstrates as clearly as possible that the Standard steel ties are not only safe, smooth and pleasant to ride over, but that they are a money-saving device and should commend themselves to railroad men from that standpoint. The life of the rails, by reason of their being held rigidly upright, must certainly be increased a good many per cent., and should go to the credit of the ties; and my observations of the lessening of oscillation and vibrations on engines and cars, especially on cars heavily loaded with yielding material like grain, leads me to believe that engines and cars running on a road laid with such ties as would show a great saving in repairs and a much longer life than is at present believed to be possible. Experience has convinced me of their great merit in preventing the spreading of the rails, keeping the rails upright and increasing the life of the same, and providing a perfectly smooth track and a sufficient elasticity. I have also recently inspected the section on the Long Island Railroad, and see no reason why it should not make as good a record as on the Chicago track."—[Railway Review.

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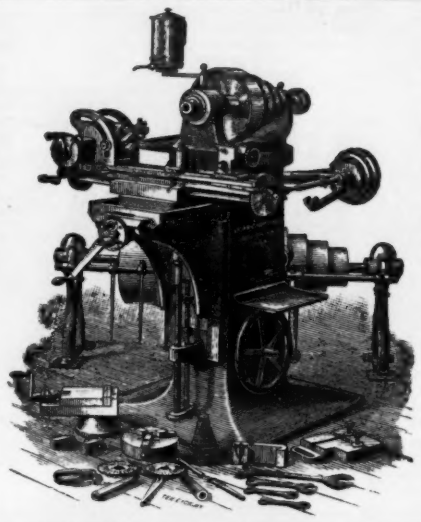

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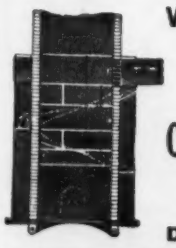

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Alphabetical List of Advertisers

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	PAGE
Aitchison, Rob't Perforated Metal Co	15
Adt, John & Son	12
Automatic Time Stamp & Register Co	14
*Arey, Clarence O	12
Buckeye Engine Co	20
Burton, W. J. & Co	14
Bischoff, F. F. & Co	16
*Berger Mfg. Co	—
Babcock & Wilcox Co	20
Buffalo Specialty Mfg. Co	18
Bostwick Steel Lath Co	16
†Butman Furnace Co	—
Bassett, Presley & Train	19
Brown & Sharpe Mfg Co	11
Brown, W. W	11
Cambridge Iron & Steel Co	13
†Cleveland Electrical Mfg. Co	19
Cleveland City Forge & Iron Co	20
Cleveland Twist Drill Co	20
Cleveland Iron Mining Co	13
Cleveland Rolling Mill Co	13–16
Cleveland Desk Co	13
Condit Fuller Co	13
*Corbett and Bacon	—
Colliau, Victor	11
Canton Iron Foundry Co	14
Cambridge Roofing Co	19
Cole, J. Wendell	20
Chester Steel Casting Co	15
Central Thomson-Houston Co	11
*Cincinnati Corrugating Co	—
*Chandler & Taylor Co	19
Corrigan, Ives & Co	13
Deming Co	18
Dearborn Drug & Chemical Co	8
Dixon, Jos., Crucible Co	15
Egan Co	15
Enterprise Boiler Co	20
Edison General Electric Co	15
Eberts Bros	20
Eclipse Electrotype & Engraving Co	17
Frank & Co	18
Flehart, J. H & Co	16
Fuller Bros	15
Felkel, P	16
Fitzgerald, W. T	12
Graham Twist Drill Co	20
Garvin Machine Co	15
*Garfield Injector Co	—
Garry Iron Roofing Co	19
Graves, L. S. & Son	15
Gerlach Peter & Co	13
*Gillette & Lewis	12
Hazelton Tripod Boiler Co	18
Hutchison, W. S	20
Harrington & King Perforating Co	13
*Hodell H. H. & Co	12
Hartford Steam Boiler Insp. & Ins. Co	16
Hackney Hammer Co	9
Hartman Sliding Blind Co	16
Hercules Powder Co	18
*Holbrook & McDonald	11
*Indiana Machine Works	17
Iron Clad Paint Co	12
Industry File Works	20
Jones, E. H. & Co	18
Jeffrey Mfg. Co	14
Jenks, James	12
Kanneberg Roofing Co	19
*Leffel, as. & Co	19–10
Lancaster, James H	17
*Long Steel & Iron Roofing Co	—
*Leffel Water Wheel & Engine Co	12
Murdock, James, Jr	16
Milton Mfg. Co	11
*Munn & Co	—
*Nerscher Sprinkler Co	9
New Philadelphia Iron & Steel Co	12
*Niles Iron & Steel Roofing Co	19
Outhwaite, J. H. & Co	13
Oglebay, Norton & Co	13
Oldfield, L. H	16
Pope, E. C	13
Parkin & Bosworth Co	20
Palmer, Cunningham & Co	14
Pittsburgh & Wheeling Coal Co	13
Penberthy Injector Co	20
Pollock, Wm. B. & Co	18
Rogers & Hubbard Co	11
Rowell Geo. P. & Co	11
Reynolds Bros	20
Schleicher, Schumm & Co	18
Sykes Iron Roofing Co	19
Sackman, F. A	14
Southwark Foundry & Machine Co	19
Stirling Co	11
Stilwell & Bierce Mfg. Co	20
Spicer Mfg. Co	11
Shepard, H. L., Agent	16
Spaulding & Metcalf	15
Skinner Engine Co	19
Stevens, F. B	19
Satterthwaite, M. P	15
*Simpson, Thos. P	12
Toledo Machine & Tool Co	18
Tod, Wm. & Co	18
Totten & Hogg Iron & Steel Foundry Co	11
Van Dusen Gas Engine Co	17
Upson Nut Co	16
Union Electrotype Foundry	14
Universal Radial Drill Co	20
*Webster, Warren & Co	20
Webster, Camp & Lane Machine Co	14
West, Thos. D. Foundry Co	14
Westinghouse Machine Co	19
Wyckoff, Seamans & Benedict	12

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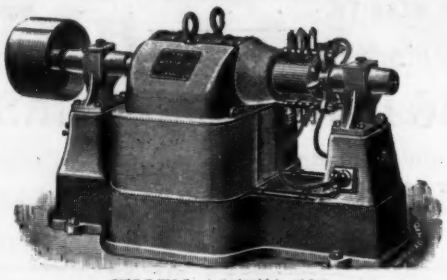

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[illegible]	4 80

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15-16, 1 and 1¼, Nos. 19 and 20	3 00
15-16, 1 and 1¼, No. 21	3 10
15-16, 1 and 1¼, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 60
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 [illegible]
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 [illegible]
⅝, No. 21	4
⅝, No. 22	4
⅝, No. 23	4

Light Band.

1⅛ to 6 by ⅛ to 3-16 in	2 20
1⅛ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ⅛ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅞ and 13-16 by ⅛ to 3-16 in	2 70
⅞ and 1 3-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ⅛ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ⅛ to 3-16 in	3 30
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅛ to 3-16 in	3 60
½ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	2 80
⅛ inch, " " " 13 and 14	3 00
¼ inch, " " " 11 and 12	3 10
¼ inch, " " " 13 and 14	3 30

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 99
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 85
Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
Flange	3 45
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	⅜c ₶ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1⅜c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ₶s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
8-6 in	14

Flats.

	cts. ₶s
2 to 9-16 wide by 2 to ⅜ thick	9

Bessemer and O. H. Steel.

Machinery	base price,	2 75
Tire	"	2 75
Spring	"	3 25
Sleigh Shoe	"	2 75
Toe Calk	"	3 00
Cutter Shoes, tapered and burr.	"	3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ¾, 11-16 and ¾ inches diameter	4 00
Bridge ⅛, ¾, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
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American ..... ₩ lb 9@10
Wrights ..... ₩ lb 12

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Blacksmiths' { Hill's ..... dis 40
Bullock's .... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

Belting.

Boston Belting Co's standard ..... dis 70
" " " extra ..... dis 60&5
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shults Raw Hide Leather Belting, single, ... dis 40
Shults Raw Hide Leather Belting, double, and Light Double ..... dis 40
Standard, oak tanned ..... dis 50&10
Alexander Brothers' pure oak tanned. ... dis 45

Blowers and Exhausters.

S. F. Sturtevant's ..... dis 20
Boston Blower Co., ... dis 35
Buffalo ..... dis 35

Borax.

..... ₩ lb 12

Chalk.

White ..... ₩ gross 50
White Crayon ..... ₩ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

Chucks.

Cushman's 4 Jaw Independent ..... dis 45
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 2 Jaw Brass Workers. ..... dis 30
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 33⅓
" Independent ..... dis 40
" Little Giant Drill ..... dis 30
Horton's Universal ..... dis 40
" Independent ..... dis 45
Whiton's Independent ..... dis 45
National Combination ..... dis 40
Sweetland " ..... dis 40
Almond Drill ..... dis 20
Morse " ..... dis 15
Skinner's Combination Lathe ..... dis 33⅓
" Independent Lathe ..... dis 40
" Universal Lathe ..... dis 40
" Drill ..... dis 15

Cutters and Reamers.

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
Gear Cutters ..... dis 15

Crowbars.

Cast Steel ..... ₩ lb 4
Iron, steel points ..... ₩ lb 3½

Drill and Drill Sockets.

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1¼" ..... dis 50&10
Morse Taper and Straight shank Larger than 1¼" ..... dis 25
Drill Sockets ..... dis 25
Standard Twist Drills ..... dis 55@55&5
Cleveland " " ..... dis 55@55&5

Emery.

	No. 4 to No. 54 gr.	No. 54 to Flour, 150. gr.	C. F.	F. FF.
Kegs, ₩ lb	4 c	5 c		2¾c
¼ kegs ₩ lb	4¼c	5¼c		2¾c
½ kegs ₩ lb	4¾c	5¾c		3 c
6 lb cans, 10 in case	6 c	6¾c		5 c
6 lb cans, less than 1	10 c	18 c		7¾c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 45@50
H. H. Barton ..... dis 50@50&10

Emery Wheels.

Detroit ..... dis 55@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Sterling ..... dis 60
Celluloid ..... dis 10&33⅓
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60
Vulcanite ..... dis 10&10

Files.

Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
ndustry File Works, hand cut ..... dis 50

Hammers.

P. S. W. ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Hack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	2¾	3¾
Hexagon	15½	11½	8½	6	5½	5¼	5
Washers	9	8	7	5	4½	4¼	4¾

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots ..... $2.30 { Less than car lots $2.40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; no. 3, $4.40 ₩ doz ..... dis 10@10&10

Packing, Steam.

Boston Belting Co. ..... dis 60
American Packing Hemp ..... ₩ lb 10@11
Russia Packing " ..... ₩ lb 14
Italian Packing " ..... ₩ lb 13@14
Plumbago Piston ..... ₩ lb 40
Morrison's " ..... ₩ lb 50
Square Flax " ..... ₩ lb 50
Sheet Rubber ..... ₩ lb 12&24
Excelsior Rubber ..... ₩ lb 48

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 50@55

Rivets.

Iron, Thousand, list November 17, ... dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

Rope.

Manilla, ½ inch and over ..... ₩ lb 15½
Sisal, ½ inch and over ..... ₩ lb 13½

Sand Paper.

B. A. & Co. ..... dis 45@50
H. H. Barton's ..... dis 40@45
New England Flint ..... dis 40@50
Barton's Garnet ..... dis 20

Saws.

Disston's Circular ..... dis 40@10
" Band ..... dis 20
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 3
Atkins' Cicular Saws ..... dis 40&45
" Mill, Mulay and Drag Saws. dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 30c "
" Tuttle Tooth Cross-cuts. dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "
Detroit Saw Works, Circular ..... dis 50
" " " Band ..... dis 25
" " " Mulay ..... dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron ..... dis 72½
Round head iron ..... dis 67½
Flat head brass ..... dis 72½
Round head brass ..... dis 60
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P. ..... dis 70
Machine, flat head, iron ..... dis 65
Machine, round head, iron ..... dis 60
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 20
Dennis ..... dis 5.25
Hussey & Binns, railroad ..... dis 40

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2¾ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine 1)	½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1½ lb Balls	11@11½c	
Cotton Wrapping 5 Balls to lb	15@16c	

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 25

Wire.

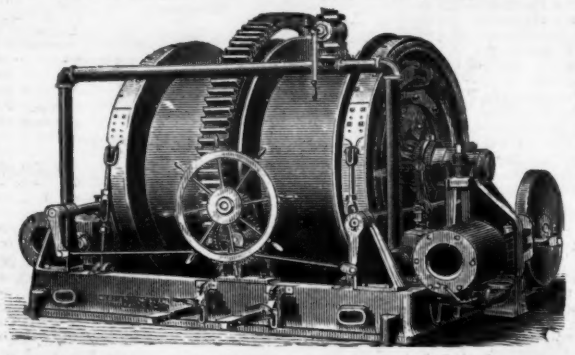
New List, Jan. 18, 1884

Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18 ... dis 70&10@75
" " Nos. 19@26. dis 75@75& 5
" " Nos. 27@36. dis 75&10& 5
Coppered Nos. 0 to 18, market list. dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire, regular ..... $6.00@lb dis 5

Wrenches.

Coe's genuine, ... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
Alligator " " ..... dis 50

Webster, Camp & Lane Machine Co.



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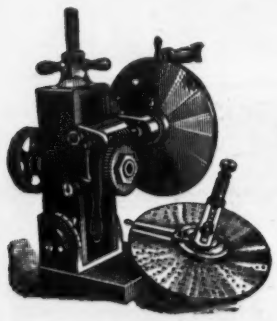

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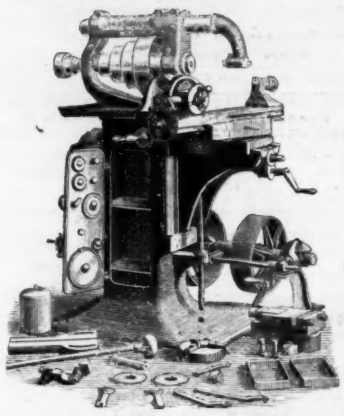

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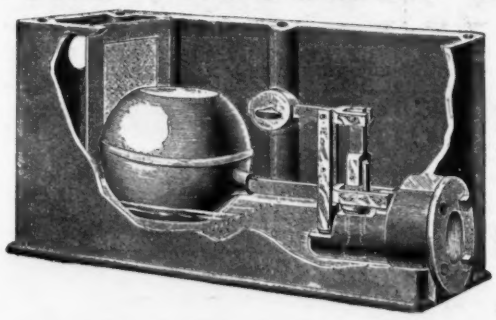

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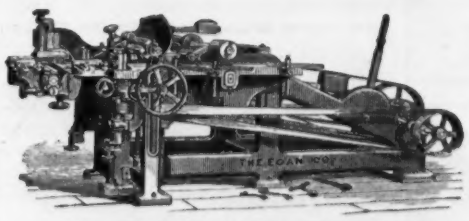

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Central Thomson-Houston Co., Cleveland.
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Skinner Engine Co., Erie, Pa.
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Southwark Foundry & Machine Co, Philadelphia, Pa.
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Webster, Camp, & Lane Machine Co., Akron.
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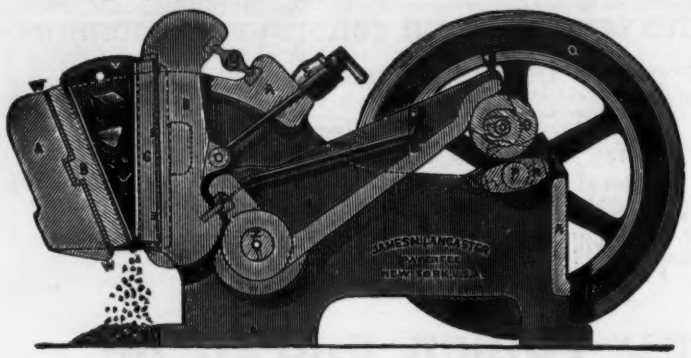

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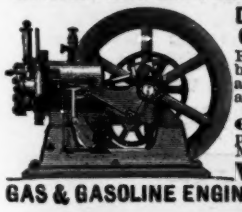

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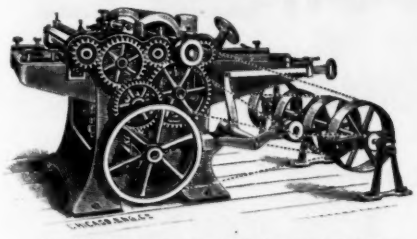

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N. Y. & Pitts. Express.....	‡5 58 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

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FOR AKRON, CANTON AND MARIETTA

Depot oot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 40 p m
Chicago Express	*8 35 a m	*10 00 p m
Marietta Express.....	†11 15 a m	†2 35 p m
Balto. & Wash. Express....	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 20 a m

*Daily. †Daily, except Sunday.

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From Cleveland Union Station.

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Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	d5 25 a m	7 45 a m
	d11 40 a m	d1 40 p m
	6 35 p m	d11 10 p m
Wellsville, Wheeling and Bellaire.	12 30 p m	7 45 a m
	6 35 p m	1 05 p m
	.....	*11 10 p m
Alliance Accom.....	10 10 a m	3 25 p m
Ravenna Accom.....	8 25 a m	5 00 p m

d Daily. * Except Saturday Other trains except Sunday. Through Pullman Sleepers to New York on 1:40 p. m. train daily.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest	d 7 00 a m	8 00 a m
	5 40 p m	d 8 00 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	12 30 p m	1 05 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	5 40 p m	8 00 a m
	10 10 a m	3 25 p m

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	Depart.
No. 62, Accommodation.....	† 6 10 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 30 p m
No. 73, Leavittsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No, 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

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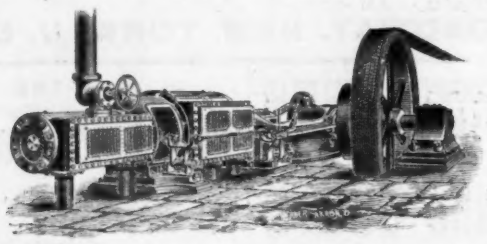

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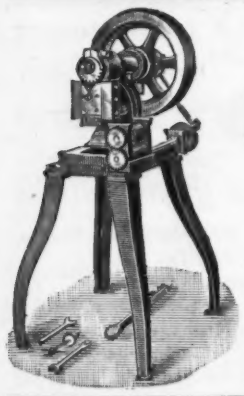

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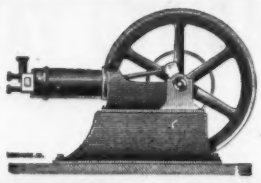

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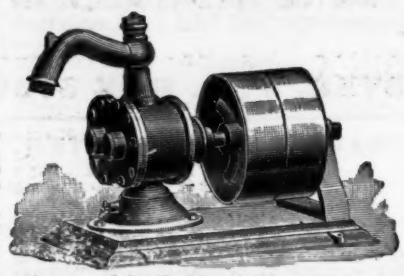

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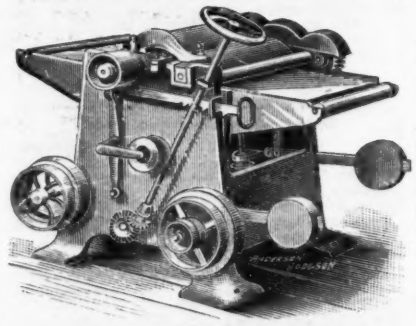

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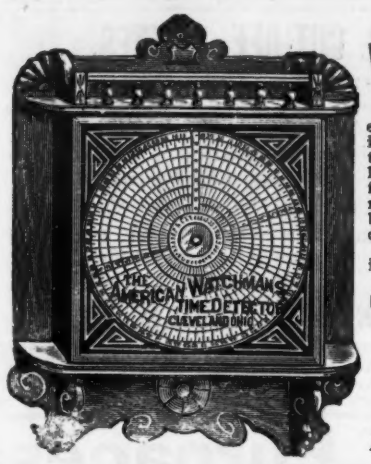

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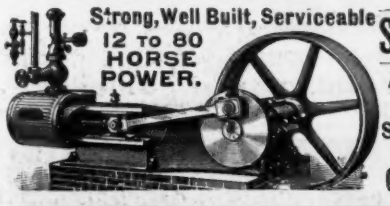

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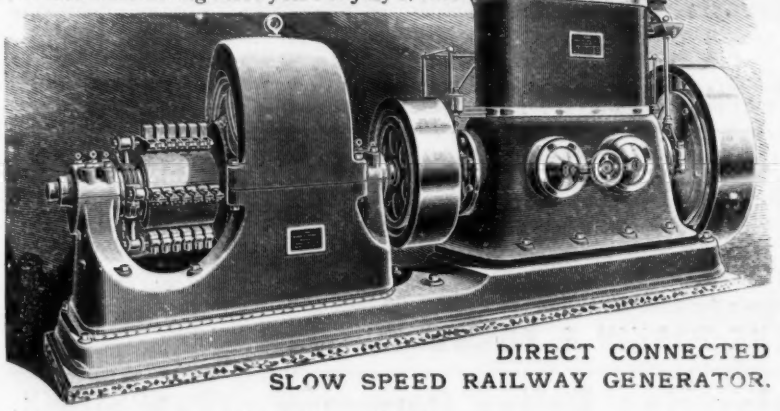

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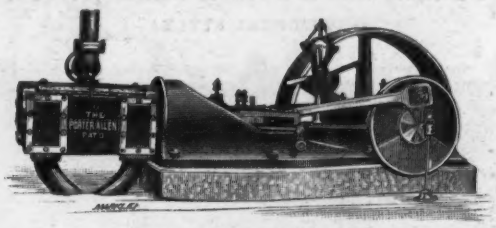

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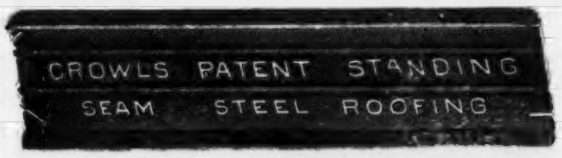

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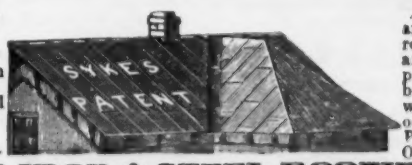

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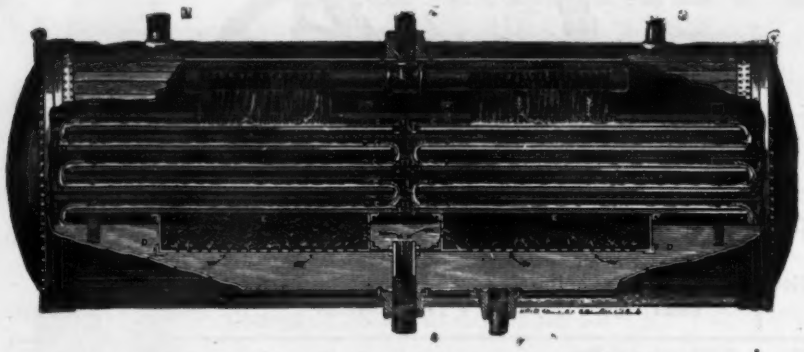

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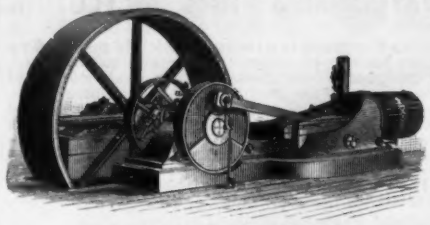

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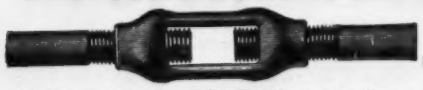

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